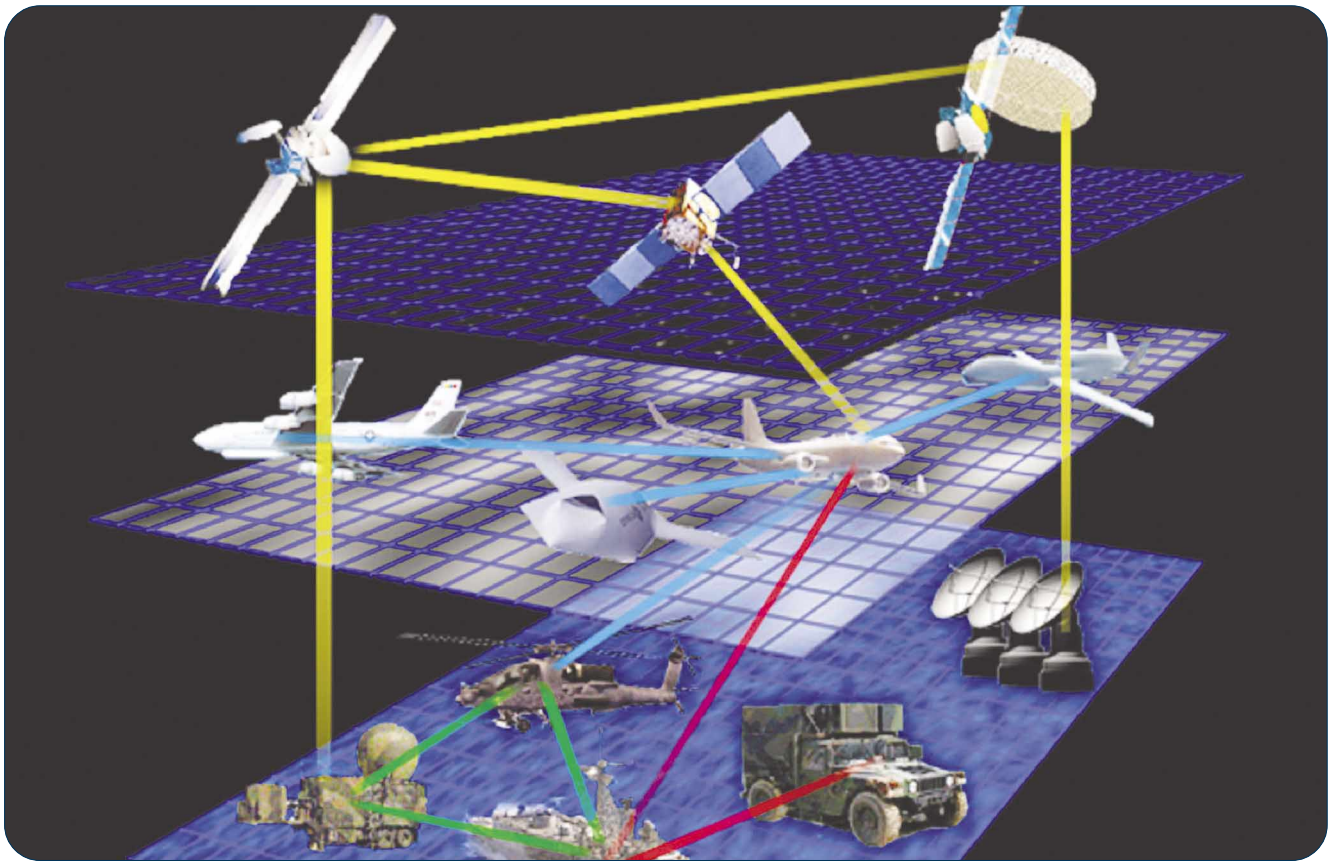

Photo courtesy of Boeing.

Tomorrow's communications in today's world

The rise of mobile Internet Protocol (IP) platforms in today's military communications is being explored by Philippa Smyth, Correspondent of Satellite Evolution Global.

It is no secret that one of the major elements behind today's revolution in communications for the military sector is the rising importance of Internet Protocol (IP). This is not unlike the wider telecoms world, where we are assisting to a 'mass migration' towards IP technology coupled with a drive towards ever-growing high speed connectivity.

Within the military environment, the same broadband IP revolution is driving the evolution of network-centric connectivity. In plain English, this means that the new communications platforms currently being developed will have the following features: provide broadband connectivity; be IP-based; and be mobile.

This trend is having an impact on all new communications platforms being developed. It was not that long ago, for example, that nobody would have even considered the possibility of using an IP communications platform on a helicopter. And yet, today the US Army has Black Hawk helicopters with an IP platform already in place. Similarly, IP terminals are being tested or have already been deployed on a series of mobile platform including boats and land vehicles.

In turn, this shift towards the adoption of IP technology is leading to the development of effective Communications On The Move (COTM), new collaborative battlefield management tools, as well as new Intelligence, Surveillance and Reconnaissance (ISR) applications.

The rise of IP

So why is IP becoming so popular amongst military technology circles? Robert Demers, Vice President (VP) of Sales Development, Americom Government Services, offers an explanation of the reasons that are driving these developments.

The wide adoption of IP technology is due to the fact that it is

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simple and can be used on all sorts of systems, for all the same reasons as apply to fixed and On-The-Pause systems today. Besides, the commonality, availability, and interoperability of IP opens the door for use of existing voice, video, and data applications and exploits a huge technical talent pool for development of new applications.

As we have seen the demand for broadband connectivity is growing in similar fashion to the commercial world: a picture is worth a thousand words, and video is even better! In fact, real-time voice, data, and streaming video from multiple points on the battlefield are at the heart of today's collaborative battlefield management tools. Broadband allows the communications applications to deliver a richness of content to and from the battlefield that was previously unavailable.

Similarly, the inexorable move towards the development of on-the-move platforms is following parallel developments in the civil environment. Smaller and more mobile teams are being deployed in situations where there is no option to stop and gather information. Broadband IP COTM supports the fast moving structure of these more agile teams on the ground and connects them to counterparts in the air and on the sea.

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Requirements and capabilities

But what are the challenges currently being encountered in the development of mobile IP, COTM systems? Naturally, there are several of them, of different difficulty grades.

By far, the biggest challenge in the design of a mobile IP system is the development of a small, stabilised, antenna system. To be effective, a mobile antenna should have approximately 40 to 50cm effective aperture and be of low to mid profile (a one metre high radome on a Humvee, in fact, is not practical for reasons that can be easily understood). Besides, the antenna needs to have a relatively low combined weight for in-vehicle and top side equipment.

At present, various high quality low, mid, and higher profile on-the-move antennas exist: all are functional, and trade-offs exist. In particular, different antenna footprints are suitable for different applications: mid profile for high performance and roll-on, roll-off, while small footprint antennas are better suited for helicopter and vehicles with limited real estate. Low profile antennas, on the other hand, have been developed for stealth applications – though performance trade-offs are to be expected.

Another issue of importance in the design of an IP mobile system is regulatory compliance, in particular in the area of the so-called Adjacent Satellite Interference (ASI). In fact, a combination of small antennas and power levels required to achieve desired performance are a significant challenge to on-the-move systems. This has a considerable impact on the feasibility of a system, as poor ASI performance requires cherry-picking of satellites, which greatly reduces flexibility.

From a communications point of view, ideally, a mobile IP terminal should support multiple network architectures depending on the application being developed. Such network typologies include:

- Hub and spoke for support of true Joint Network Centric (JNC) operation;
- Mesh for support of forward deployed hubs as exist with the Joint Network Node (JNN) architecture; and
- Single Carrier Per Channel (SCPC) for ad hoc point-to-point requirements.

But, what is the network performance that can be expected for all these applications? In the case of a hub and spoke network the data rates should go up to 10Mbit/s to the remote terminal and up to 512kbit/s from the remote back into the network. For network architectures such as mesh and SCPC, on the other hand, the rates should be approximately 2-3Mbit/s in both directions subject to technology and regulatory compliance.

It is worth nothing that oversubscription on any shared architecture must be conservative in order to support time sensitive applications like video and voice.

What the networks are for

Once the networks have been built, they are used extensively by today's Armed Forces. It is worthwhile, however, take a quick look at the way such networks are used.

As a category, command and control applications are driving the need for COTM capabilities. Command Post Of the Future (CPOF) and Advanced Airborne Command and Control (A2C2S), which incorporates CPOF good examples of this trend.

Traditional Video Teleconferencing (VTC) and unique applications of inbound and outbound streaming video are driving higher bandwidth requirements specifically in the inbound direction from the vehicle back into the network.

Wireless Fidelity-enabled (Wi-Fi) COTM vehicles or aircraft are functioning as mobile broadband access points. Use of high-powered secure Wi-Fi can extend the last mile access in the field, thus extending the reach over multiple miles.

The list of possible applications could go on, but it is worthwhile adding that there are several possible additional applications that become possible with mobile broadband IP. For example, while not a collaborative battlefield management application, use of the same COTM technologies and services has the potential to dramatically increase IP connectivity to large deck ships while reducing the required antenna size.

Beyond technology: service requirements

Whilst interesting, looking at possible applications for an IP broadband network could be misleading. Several organisations and end-users, in fact, prefer to approach the matter from a different standpoint: that of service requirements. It is true, in fact, that different organisations might have different requirements for the same application. One organisation, for example, might be interested in turnkey service and public Internet back-hauls, while another one might want varying levels of hands-on management, highly secured backhauls, and want to provide elements as Government Furnished Equipment (GFE). Within this context, it does not make sense to talk about 'generic' applications. It is evident how flexibility, therefore, is key to meeting the requirements of the end-users.

From the point of view of frequency bands, things are rather varied. L-band has set a good example, as it currently meets certain requirements and is globally available for less demanding applications. Ku-band offers the flexibility of high number of on-station satellites and transponders, while Ka-band services are not practical at present due to limited coverage. ■