Photo courtesy of the US Department of Defense.

The IP migration: a military operation

A 2003 mandate from the US Department of Defense called for the rapid conversion of the military communications system from legacy systems to IP. Known as 'Everything over IP', the programme is changing the way in which the military communicates. Global Military Communications finds out what the change to IPv6 will mean and the companies helping them to make that switch.

The quest for a network-centric military has led to a transformation in the way that information is disseminated around the battlefield. We know that critical information must reach the right person, at the right time, in real time. The military must know when and where something happens. Delay is not an option and critical decisions must be made as quickly as possible. If information can be simultaneously broadcast down the chain of command the advantages would be invaluable. The legacy systems and multi-vendor networks that the military worked with in the past were enabled through different technologies and were difficult to integrate. The emphasis today is very much on interoperability and ease of connectivity between different sections of the military. The web of different technologies used is incredibly complex and bringing them all together is quite a challenge. That is why the military is turning to Internet Protocol or IP. IP can bring together the various different communications systems under one umbrella, one standard, and can allow interoperability and therefore information sharing to all who require it. This may be achieved with Commercial-Off-The-Shelf (COTS) products – a sure way to reduce costs of implementation.

IPv6 – the future

Internet Protocol is the standard that can support all the applications required by the military today such as voice, data and video, communications-on-the-move and airborne communications. In fact, IP

was originally designed for use by the military. Today many communication providers are asked by military customers for full IP technology and a wide range of platforms are available due to its flexibility and simplicity. In 2003, the US Department of Defense issued a mandate that the military should move to 'Everything over IP (EoIP)' in order to help bring the military truly into the 21st century with unparalleled access to information in real time. The latest version of IP, IPv6 is gradually replacing IPv4 that has been a standard within the military since 1978. Let's look at IP in a bit more detail.

The Internet Protocol (IP) is the method by which data is sent from one computer to another on the Internet. Every host, or computer, on the Internet has at least one IP address that uniquely identifies it from all other computers on the Internet. When you send or receive data (for example, an e-mail note or a Web page), the message gets divided into little chunks called packets. Each of these packets contains both the sender's Internet address and the receiver's address. Any packet is sent first to a gateway computer that reads the destination address and forwards the packet to an adjacent gateway that reads the destination address and so forth across the Internet until one gateway recognises the packet as belonging to a computer within its immediate domain. That gateway then forwards the packet to the computer whose address is specified.

IP does not involve connections, which means that there is no continuing connection between the end points that are communicating. The packets are independent units of data. IPv4 is the version that is used today but the introduction of IPv6 is starting to happen. This version has wider capabilities and will facilitate new applications.

IPv6 holds the key to network-centricity. If the military is networked in a robust way, then information sharing is enhanced leading to improved situational awareness, self synchronisation and ultimately, more effective completion of missions. This network-centricity will provide 'Power to the Edge' that will enable those even on the very tactical edge of the network. No-one will be left out of the loop. The migration to IPv6 represents transformation and the changes that are happening today are reflected in the increased capabilities in the field such as communication-on-the-move, for example. The IP bedrock will provide ubiquity, mobility and operability. IPv4 can no longer support the requirements of the military but IPv6 can. IPv6 enables:

- Network ubiquity and scalability;
- Unlimited address space (something that is a major issue with IPv4);
- Global routable addresses;
- Quality of Service;
- Enhanced Plug-n-Play and mobility;
- Auto configuration;
- Improved multicast;
- End-to-End mandatory security;
- Improved header; and
- Network maintainability.

The IP transition will leave no stone unturned. It will eventually permeate into all aspects of military communications. However, the transition is challenging. Implementation is ongoing and coincides with planned technology upgrades. There are numerous large-scale networks to convert, all over the world. Security threats and weaknesses in IPv6 will need to be identified and overcome. Plus, IPv6 is being introduced alongside IPv4 and ongoing testing and evaluation will be part and parcel of the transition.

Achieving the IP goal...cost effectively

It's all very well migrating over to IP but what is this going to cost? Perhaps it is not as much as you would think because, as mentioned previously, the availability of commercial-off-the-shelf products that can achieve the desired result are widely available to the military. Commercial vendors can tweak their products to suit military use, whether that is through ruggedising them or ensuring that they can withstand harsh and challenging environments. This brings the cost down as the products do not have to be specifically tailored to suit military only. IP is the protocol used in communications today whether that is in business and enterprise or at home. There has been an IP 'revolution' if you like and this means that availability of a huge range of products that meet the standard are available from many different suppliers. The result of the migration to IP will result in a more cost-effective communications network for the military.

The following communications companies have developed products to help the military make the transition to IP.

Rivulet

Rivulet Communications, whose technology enables flawless real-time services delivery over IP networks, has recently announced that it has signed Maryland-based Choicecomm LLC as a new channel partner. Choicecomm provides customers with a single knowledgeable resource for researching, obtaining, and servicing IT and communication networking transmission products. The agreement enables Choicecomm to provide its military, intelligence and civilian federal agency clients with Rivulet's complete suite of networking products.

"As government agencies transfer from TDM and ATM to more cost-effective IP networks, they need to guarantee the delivery of real-time applications such as video and circuit emulation over heavily utilised networks," said Woody Story, Choicecomm President, "and they're looking for a solution. Rivulet has the ideal solution to this problem; they provide flawless transmission of mission-critical applications over IP and, as a result, they are in a class by themselves."

"Rivulet is pleased to have Choicecomm as a channel partner for federal government sales," said Ed Kennedy, Rivulet CEO. "Our ability to solve the problem of QoS in the network in conjunction with Choicecomm's successful relationships with government customers will help us increase our penetration of the defence and intelligence markets. Choicecomm also is an excellent partner to provide services to those markets."

Rivulet offers a unique solution for the transition of real-time TDM facilities onto a common IP backbone, avoiding over provisioning and allowing nearly complete utilization of facilities. The Rivulet solution provides not only a significantly reduced initial investment but also lowers the operational and management costs associated with operating separate networks. In addition, Rivulet has the ability to support encryption devices within military networks meaning that Rivulet can accept bit-synchronous traffic from the encryption devices and transport it across the IP backbone with low latency and high reliability.

PacStar

Pacific Star Corporation or PacStar, a technology-based provider of communications solutions to the military and government, has partnered with INX and World Wide Technology to deliver the PacStar 6000 set of solutions to the military.

The PacStar 6000 series is designed to meet Congressional and Office of the Secretary of Defense (OSD) directives that mandate military networks move to IP-based communications.

For base-level or tactical communications, the PacStar 6000 series connects directly to the Defense Systems Network (DSN) to maximise strategic and situational awareness over one communications pipe.

"We recognise that providing fast, reliable communications is critical to the military, especially when the chain of command can be thousands of miles apart at any given time," said Roger Haney, Area Vice President – Federal Sales of INX. "The new IP solutions from PacStar deliver the next generation communications network that is easy to use, deploy, manage and maintain. INX is a leader in providing communications infrastructure to the military and we are excited

to be able to offer the PacStar UC solutions."

"The partnership with PacStar furthers our commitment to providing best of class networking and communications solutions to the government," said Bill McKeon, Vice President of Federal Sales for World Wide Technology. "The PacStar 6000 series will set the standard for IP connectivity to the Defense Systems Network (DSN) moving forward. We are looking forward to providing our expertise and know-how to ensure US soldiers have the best possible communications equipment to ensure mission success." The PacStar 6000 series comprises of the following products:

- PacStar 6300 Deployable UC Exchange is designed for deployed operations, and managed through PacStar IQ-Core Software, the PacStar 6300 brings the power of IP communications to the warfighter, yet requires reduced training and operations support services.
- PacStar 6350 UC Extender increases the trunking and tandem functions of the 6300 and adds Cisco's MeetingPlace Express. The units are delivered with PacStar IQ-Core Case technology that provides ruggedisation, remote management, and environmental conditioning.
- PacStar 6800 Enterprise UC (Unified Communications) Exchange is a rack-mounted UC solution designed to meet the stringent DISA requirements to provide communications services through the DISN, and provides Everything over IP-converged services.

"We are pleased to be partnering with INX and World Wide Technology," said Robert Frisbee, CEO of PacStar. "Through the partnership, we will expand our ability to provide the military with IP communications solutions. Based on our IQ-Core Software, the solutions can be easily deployed and managed without having to rely on technical experts in the field. In fact a usability survey conducted by a third party organisation showed that IQ-Core Software provided up to seven times improvement in speed and ease of operations and three times improvement in time savings and error reduction."

Command information

The Advanced Incident Response Solution (AIRS) is designed to support the military in combat situations by monitoring real-time vital signs, environmental conditions and locations over a secure, hastily formed network. Developed by Command Information, the IPv6 solutions provider and built in conjunction with Cisco, Arch Rock, and pTerex AIRS provides the first fully net-centric, end-to-end IPv6 solution for merging the situational awareness of soldiers, their commanders and their environment into a single, real-time Common Operational Picture.

"The advanced networking capabilities of AIRS will provide military commanders and personnel with the tactical data needed to effectively manage an operation," said Vice Admiral Jerry O. Tuttle, US Navy, (Ret.) "Best of all, the information will be available in time for the commander to direct warfighters in real-time as new information is compiled."

"Communications are a vital component of any military operation and we are leveraging innovations in communications that IPv6 brings to the real world," said Tom Patterson, Chief Executive Officer of Command Information. "As a true net-centric solution for military communications, AIRS is available to be immediately and cost-effectively adopted by the military that require mobile ad-hoc network solutions and real-time visibility to save lives."

AIRS enables real time transfer of critical information and networked awareness of all incident outcome determinants including:

Photo courtesy of the US Department of Defense.

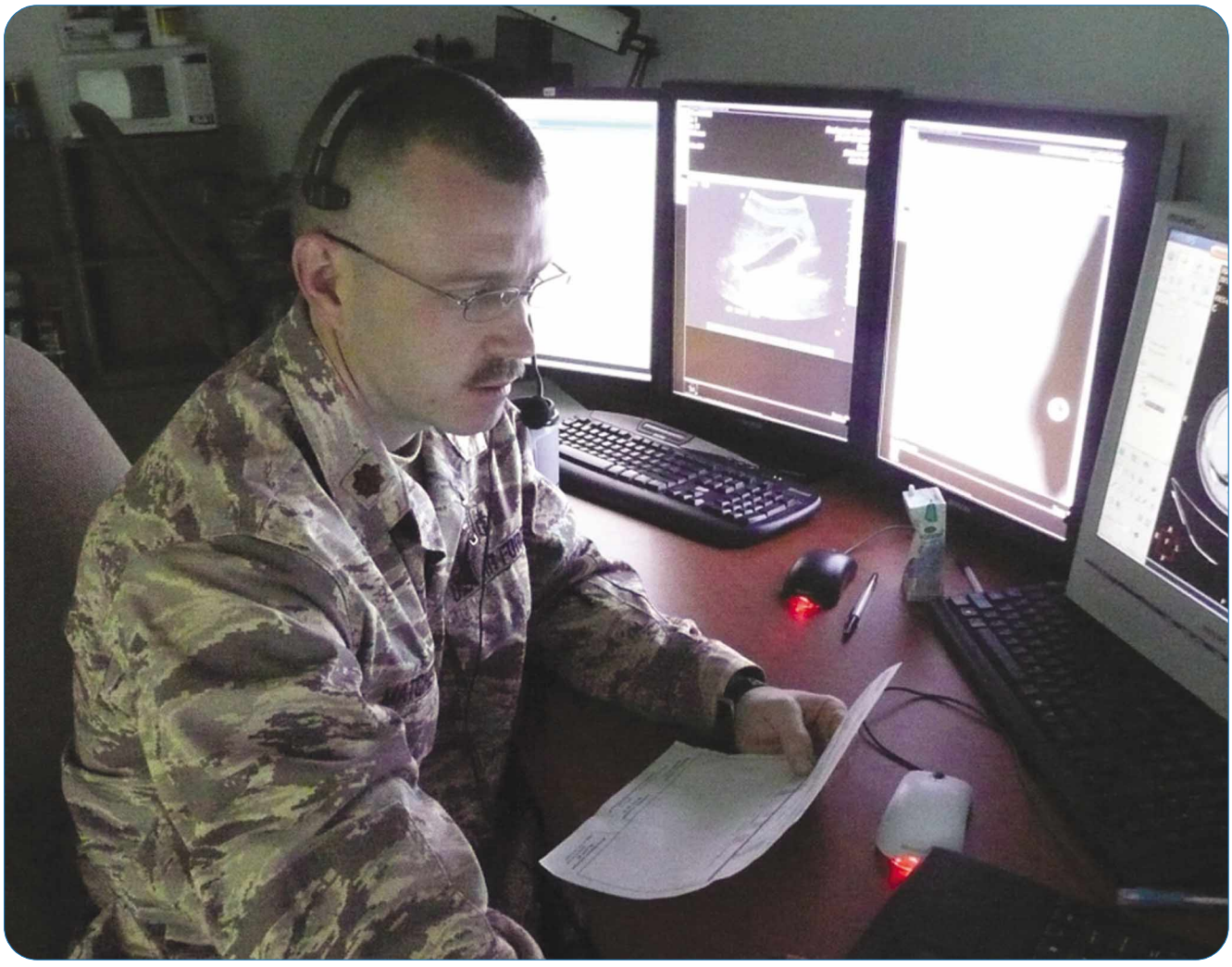

Photo courtesy of the US Air Force.

- Location and biometric/environmental conditions of warfighters;
- Condition and environmental activity of surroundings;
- Location, availability and condition of military assets;
- Ad hoc situational awareness of, and full communication with, new warfighters as they enter the situation; and
- Fully executed on-site Command Centre and/or Headquarters engagement in every facet of incident response.

AIRS capitalises on a structured, scalable approach to the implementation and management of mobile IPv6, wireless personal area networks, NEMO peer-to- peer networks, and IPv6 low power wireless personal area networks to enable the full power of mobile ad-hoc networking to be brought to bear on any emergency.

The real-world benefits from deployment of the AIRS project include:

- Value from leveraging the IP consolidation taking place in the network, sensor, programmable logic controller (PLC), device and appliance markets for incident responders;
- A solution based totally on CTIS technologies;
- Capability to scale to address multiple incident response scenarios;
- Potential reduction or elimination of multiple proprietary communication protocols deployed for incident response. Any standards-compliant IP device can be introduced into the system;
- Superior information pulled from sensors, programmable logic controllers, and devices used by incident responders will povide accurate monitoring of physiological and environmental metrics of responders and their operating environments;
- Ability to have a proactive response to human and environmental metrics; and
- Additional data gathering potential without introduction of new communications equipment.

A crucial move

The US Department of Defense has put a deadline of 2012 for the military be 'IPv6 Ready'. IPv6 will guarantee a highly efficient, digitised and mobile force that is connected in a way never seen before. This is a momentous task that is being undertaken and it will take time and an ongoing programme of modernisation but once complete it is certain to be worth the wait - and the work. COTS products are playing a significant part in the switch to IP and are flexible and scalable and future-proofed as they are easily upgraded. They are also much more cost effective than proprietary systems and equipment. For nations engaged in war as many are at present, the need to move forward and develop more advanced and secure communications capabilities is paramount. With the increasing list of IPv6-ready vendors and the will to drive the programme to completion, the 2012 deadline looks like it will be a reality and network-centricity will no longer be the future. It will be here.