

Why use Open Architectures?

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Present Day Challenge – Disintegrated Stove-Pipe Solutions

The historic approach to delivering RF mission systems for Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) and Electronic Warfare (EW) saw the development of monolithic 'stove-piped' equipment. These systems responded to immediate RF mission needs, but without prioritising the integration between standalone systems. This has left a patchwork of hard-earned system interoperability, rather than creating a planned and optimised homogenous base to build future capabilities upon.



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This evolved collection of disintegrated solutions sees a high degree of functional duplication with little useable redundancy. Dedicated compute nodes, power systems, and location services drive up the Size, Weight and Power (SWaP) envelope, leaving less space for personnel while making platform Electro-Magnetic Compatibility (EMC) control problematic.

The relentless pace of commercial telecommunications development has put extreme pressure on this legacy approach. This often renders custom equipment programmes superannuated upon delivery, plagued by obsolescence in support and unable to deliver their intended benefit within the Cyber and Electromagnetic Activity (CEMA) landscape. When coupled with long procurement cycles and a limited supplier base, staying ahead of the curve becomes all but impossible.

The Benefits of Open Architectures as a Solution

Moving to an open standards based approach to Radio Frequency (RF) system architectures is a non-trivial task. To effectively prescribe a suite of standards that will service such a diverse range of requirements - some of which, as yet, are not fully known - might in the first instance seem like folly. However, the history of standards development in the commercial sector shows how an iterative and collegiate approach to developing standards can produce highly successful and sustainable systems.

Coordinating the approach to CEMA

Current joint doctrine notes a move away from military services conducting CEMA independently, advocating for more coordinated joint force activities. This is considered an essential step within sovereign forces, but is also a key enabler when operating alongside a wider group of allies, many of whom are also transitioning to a holistic services footing. An enterprise approach to information management allows more portability of information between mainland and contingent theatres, and also presents opportunities for more coordinated activities between other government departments.

Modular Open Suite of Standards

Implementing a suite of layered standards for hardware, software and networking allows the benefits of each standard to be individually realised, whilst also combining to form a fully converged architecture.

- The hardware layer defines common form-factors for physical, electrical and environmental interfaces, ensuring new capability-specific hardware modules can be fielded with minimal disruption from platform integration activities.
- The software layer builds a framework for component-based applications that target heterogeneous embedded hardware systems (GPP/FPGA/GPU). This supports the portability of electronic surveillance, defence and attack capability applications across the full fleet of future platforms.
- The network layer provides a scalable interface for new intra-platform capabilities whilst also providing an interim interface for legacy systems to access shared services. In addition to supporting fleet management and In-Service Support (ISS) activities, a networked connection between platforms and the wider enterprise can augment local system configuration with wider strategic level EW management insights.

Combining modularised radio functions such as switches, amplifiers and antennas with a system level scheduling service, allows sharing of scarce RF resources. This supports efficient use of the hardware that is often a challenge to SWaP and platform integration. A modular approach not only permits system scaling and dynamic re-configuration, but also lowers the operator's cognitive burden through the implementation of a common and familiar Human-Machine Interface (HMI).

More than just a technical solution

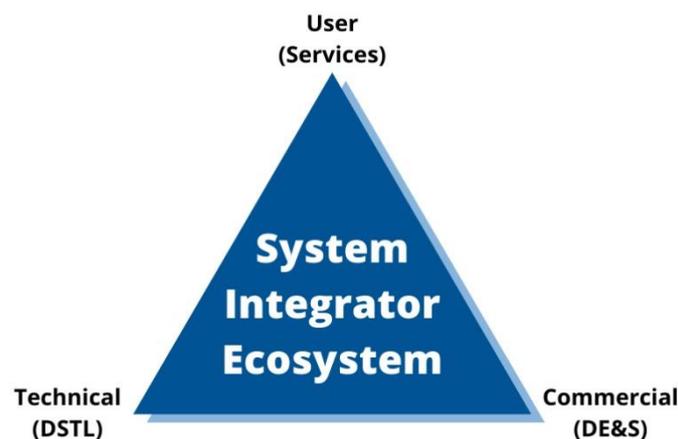
Applying open standards to technical architectures clearly brings significant benefit to the capabilities available to commanders, but the potential of this approach is only fully realised when commercial entities (be that with industry or the Authority) internalise the possibilities into their cultures.

The most apparent benefit commercially for the Authority is the ability to break the strangle-hold vendors have had over the deployed 'stove-pipe' solutions. Although always commercially possible to move away from original equipment suppliers, the technical challenge in upgrading proprietary systems limits the available options. Seeking out independent industry partners who are willing to work at refining a suite of standards and publish into a pool of open knowledge is essential to realising the vision of an evergreen future; a future that can completely re-imagine the traditional In-Service Support (ISS) model.

It is not enough to merely drive the industrial base to convert to an open standards driven position. Many of the Authority's previous best-practises will also need to be scrutinised to ensure that the most can be made of the cyclical and incremental upgrade opportunities. This will require an agile contractual approach that prioritises a rapid procurement methodology to acquiring new Commercial Off-The-Shelf (COTS) technology as it becomes available.

The New Normal is Here

This is not purely an exercise for the technical design authorities to advocate for the adoption, adaption or authoring of open standards. This pivot to an entirely new way of delivering capability will take strong leadership from all stakeholder groups. The embedded change of culture at all levels of the Authority triumvirate, from commercial, technical and users, will need to be matched by a re-structuring of the industrial base to take advantage of these new opportunities.



When future systems are built upon architectures that are underpinned by open standards, upgrades and enhancements can be smaller in scope and scale. This means they are serviceable by a wider industrial community, some of whom would otherwise have been unable to respond to large megalithic contracts. This energising of a broader ecosystem of SME suppliers will bring a greater number of niche technology experts closer to the problem space, ultimately resulting in capabilities that can better keep pace with changes in the external technology environment.

This is happening now. The Authority are learning what it means to let these new contracts; industry are learning what it means to be system integrators with diverse ecosystems of conscious and unconscious suppliers; and the whole domain is becoming more collaborative. As the standards drive the solutions, and the solutions influence the standards; the delivery, business and technical architectures of future CEMA systems are opening.

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