



Summary

The combination of the NG Portal, community-developed Systems Standards, network expertise, security functionality, and strong relationships with commercial network providers makes the DMON uniquely capable to meet CAF simulation training requirements. The DMON is not just a network — much more is required to keep our warfighters ready for the fight... and the DMON delivers daily.

Over the course of developing rules and improved capability since the first event in 2006, the DMON has successfully hosted dozens of successful cross-domain events and now routinely operates in this mode for daily team training. The management of CIs is a specialty task, requiring technical expertise, process maturity, and deep understanding of the approval process for rules and devices. Without this multi-domain capability, the inter-team training would be severely limited and in some cases impossible to achieve.

High-Performance WAN

The network infrastructure for the DMON was designed from the outset to provide high-bandwidth, low-latency, high-quality connectivity for the MTCs listed on the CAF DMO roadmap. Because the network does not exist to provide general connectivity or persistent data sharing services, it has been optimized for its role in supporting inter-team training through distributed simulation and brief-debrief activities. Constant monitoring and metrics are used to ensure that the network is available and operating efficiently in providing this solitary function.



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Distributed Mission Operations Network (DMON)

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The Distributed Mission Operations Network (DMON) is an event-centric, standards-based, centrally managed, multi-domain capable, high-performance, wide-area network operating at the SECRET level with special access components that supports globally Distributed Mission Operations (DMO) inter-team training for the Combat Air Forces (CAF). DMON has been used on a daily basis since 2002 to provide effective tactical and small-unit training on a common synthetic battlespace. DMON is also used to support Virtual Flag training exercises two to three times a year and more recently to prepare warfighters for deployment to Red Flag live training exercises.

DMON features have been carefully designed to support the primary mission: frequent inter-team training among multiple CAF platforms with missions that are carefully selected for the intended training audience. Northrop Grumman, the Operations and Integration (O&I) contractor, manages a commercial local and wide-area backbone from the Military Point of Presence (MPOP) on over 50 USAF bases to CONUS and global network providers. The O&I manages the security infrastructure, ensures the appropriate Quality of Service (QoS), oversees the interoperability standards development effort and provides a technical interoperability and bandwidth management service through the NG Portal located at each CAF Mission Training Center (MTC). All of these features are essential to provide an effective inter-team training environment to the warfighter. In other words, the DMON is much more than a network — it is a managed service that is carefully focused on the inter-team training environment.



Event-Centric

Each training event on the DMON is scheduled individually with the participating MTCs. The platforms, duration, security and specific data management requirements (such as data filters) are specified in advance.

O&I event managers ensure that the network and Portals are properly configured to provide a seamless virtual battlespace for the participants. Because the network is not a shared resource and the intricacies of routing, bandwidth, latency and security are centrally managed, event participants are able to enter the simulated environment immediately with high QoS. Changes to the configuration of the network to accommodate new players or security domains are transparent to the end user. DMON connections are mutually exclusive for events. There are no disruptions to event quality or to other concurrent events that could occur, if on a “party-line” style always-on network connection.

Standards-Based

The MTCs on the DMON are built by a variety of Federate System Providers (FSPs) and operated by a variety of contractors and/or local USAF personnel. The FSPs were put under contract to deliver simulators or training services at various times in the past and the simulators themselves range from mature and stable to developmental in their

life-cycle. While most of the MTCs operate using the Distributed Interactive Simulation (DIS) protocol, a few rely on the High-Level Architecture (HLA) to drive the simulated environment. With such a wide variety of simulation maturity levels, protocols, missions and technical implementations, there is a substantial challenge in ensuring that they can effectively interoperate to the degree required to support inter-team training. While industry standards such as IEEE 1278 (DIS) and IEEE 1516 (HLA) provide a syntactic (data sharing) level of interoperability, they do not by themselves provide the required semantic (data meaning) commonality.



To address this, the O&I contractor leads a Systems Standards development effort that involves all the stakeholders (customers, FSPs, acquisition, and security specialists) in the production of program standards that extend and supplement the industry standards. The CAF DMO System Standards provide the necessary scope, richness, and focus for the simulated battlespace to immerse the warfighter in realistic combat conditions. The Systems Standards are based on Mission Packages: annual updates that reflect the content of the simulated battlespace and synthetic environment that will be common

to the DMON players in a given calendar year. These annual Mission Packages are used to drive FSP engineering activity and contracting actions that incrementally improve the breadth of simulated missions available to CAF DMO participants.

The cooperative and incremental approach to developing CAF DMO capability has proven very successful and can be contrasted with authority-mandated battlespace content and protocols on other large-scale DoD distributed simulation programs. It also has provided much more rapid progress in the addition of scope to the battlespace than has been the case for “ad hoc” or “every man for himself” distributed simulation environments. The Systems Standards process provides an effective means to prioritize capability development and ensure interoperability in key functional areas which grow in time.

Centrally-Managed

The O&I contractor is required to provide the interconnectivity to the MTCs sufficient to allow adequate inter-team training. They do so by taking advantage of commercial networking developments and continuously upgrade the network infrastructure to take advantage of the efficiencies and capabilities that emerge in the marketplace.

This is effective because the O&I has the necessary expertise in network technology, infrastructure configuration management, and information security; and maintains long-term relationships with commercial wide-area network providers.

One of the keys to providing a high-quality training network is the ability to intelligently manage

the network traffic. This is accomplished with the NG Portal, which is far more than a gateway or translator. Each MTC connects to the DMON through a Portal. The Portal provides mechanisms to allow workarounds for simulator incompatibilities, whether those arise through areas outside the Systems Standards content or because of technical issues or timing of software releases at the various MTCs.

The Portal conditions network traffic by intelligently employing DIS dead-reckoning techniques to reduce the need for state updates. It smoothly translates from local-area network (LAN) to wide-area network (WAN) protocols and back, thereby ensuring that remote MTCs appear as if they were on the same LAN as the other local MTC assets. The Portal translates between the DIS and HLA protocols as necessary and provides other data stream conditioning functions that support datalink interoperability and cross-domain controlled interface implementations. Because the

Portal configuration is managed centrally, event managers are able to anticipate the needs of a scheduled set of MTCs and make changes to support the event based on known platform limitations at each MTC. This knowledge would be difficult to acquire and maintain if each MTC had to do so on its own for the rest of the network.

Multi-Domain Capable

The DMON includes some MTCs that operate with special access program restrictions that are not shared across all the platforms. Producing a common battlespace that uses these sites requires that the network domains be isolated with an approved Controlled Interface (CI) device. The DMON Cross-Domain Solution (DCDS) provides the CI for the protected MTCs. The DCDS executes a technical rule set developed by a Rules Working Group that includes representation from the FSPs, security community, end-users, platform subject matter experts, and O&I engineers.

