



Full Motion Video Services White Paper

Executive Summary

The Department of Defense (DoD) is at an inflection point in meeting its Full Motion Video (FMV) distribution requirements. Service budgets are shrinking, and there is significant pressure to consolidate unique infrastructures into a common “Service Provider” model to operate and maintain a FMV capability which can be leveraged to meet a breadth of operational requirements. An enterprise approach to consolidate FMV services across the Communities of Interest (COI) is the suggested way ahead.

FMV services provide timely, reliable, relevant, and discernable video imagery from fixed and mobile platforms to the COI. These video feeds can be sourced from Remotely Piloted Vehicles (RPV) and other Intelligence, Surveillance, and Reconnaissance (ISR) programs and sensors.

A scalable, end-to-end architecture with high availability and reliability is needed to transport and disseminate these FMV services across the globe to their authorized destinations.

Challenge

In an effort to meet the rapid escalation of user community demands for such content, individual military branches and agencies have created unique and non-scalable solutions. These solutions have often leveraged proprietary technologies, which are then distributed over isolated transport mechanisms. While this may be operationally effective for specific mission capabilities, it is not an effective “economy of scale” solution that can address the growing breadth of video requirements for secure worldwide distribution of these collaborative services across the COI.

The implementation of a global enterprise network that transports standardized FMV to increase its availability to the COI is required to eliminate scaling problems. Typically, for the DoD this is accomplished by means of a common service provider, where their global architecture is utilized to efficiently transport the controlled content based on Pre-Placed Keys (PPK). The intended result would be a consolidated DoD video service with greater cooperation as video services would now be universally accessible across a worldwide network based on mission needs and permissions.

An Enterprise design would also enable education and implementation through a lifecycle approach. This would enable alignment of roles and responsibilities based on organizational mission (source, transport, dissemination, and consumption), as well as technical and business competencies.

As an example, for the United States Special Operations Command (USSOCOM) Special Operation Forces (SOF) COI, the FMV service is delivered to them from their common service provider's "transport network." From an architectural design standpoint, this transport network should be provisioned to reach an authorized SOF entry point, or Point of Presence (POP). This modular or tiered approach allows SOF to first control, then refine and distribute the essential FMV information accurately within their internal architecture and to their authorized end users.

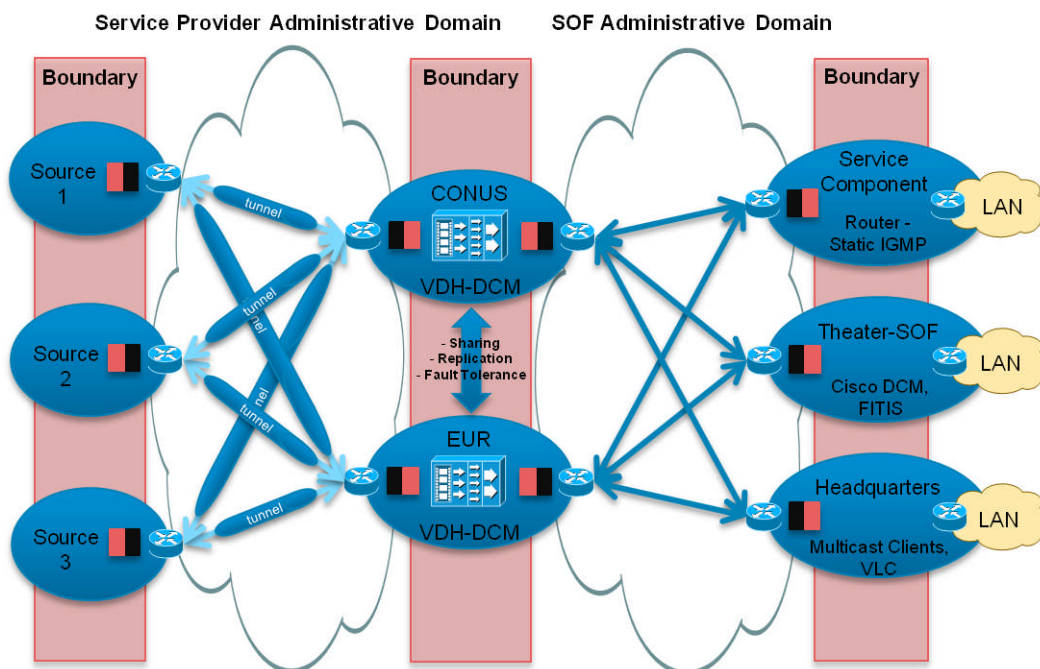
The USSOCOM's SOF Information Enterprise (SIE) network topology has redundancy (high availability) and survivability (reliability) capabilities built into its global architecture. Therefore, the creation of a minimum of at least two entry points (POPs) is a recommended design for delivery of FMV feeds into the SIE. Both POPs should be geographically disbursed, such as one located in the Continental U.S. (CONUS) and another located in European (EUR) theater. By taking this design approach, along with a distributed Data Farm solution (private Cloud Computing Model) at each POP, SIE users would now have the capabilities to store, disseminate, control, archive, and secure valuable FMV information to meet their mission needs.

Architectural Approaches

This concept suggests two architectural approaches that could be leveraged to further disseminate FMV services to end users.

1. A SOF Distributed FMV Multicast Domain Architecture

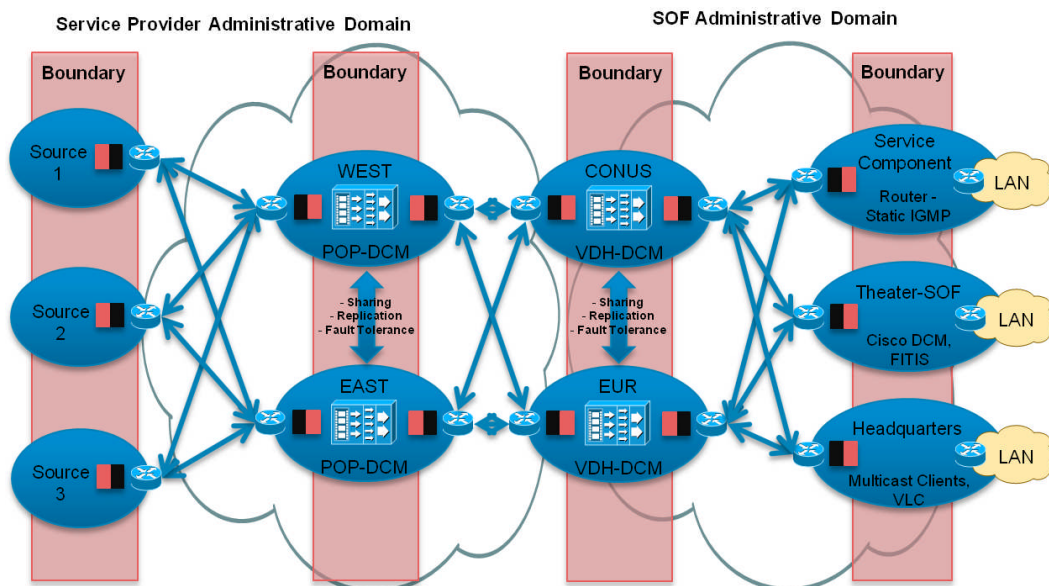
A SOF Distributed FMV Multicast Domain Architecture, which is a tiered and modular design, applies the two strategic goals of "transport and dissemination" based on the physical administrative domains that are present in the DoD. This design delineates a simple architectural approach for multicast distribution within the SIE through its redundant Video Distribution Hub (VDH) entry points. Within each SIE POP at the VDH, the video would be decrypted using PPK and then logistically networked into a Cisco Digital Content Manager (DCM) for processing. These DCMs act as both a multicast server and client that conditions source FMV feeds derived from the service provider's transport network and into multicast video feeds for authorized SOF clients. The actual DCM conditioning (e.g., transcoding, frame rate reduction) is dependent on the source input and client output requirements. The key point in Architecture 1 is the unicast, point-to-point transport of FMV feeds to the SIE VDH entry points. A high-level depiction of Architecture 1 is presented in **Figure 1**.

Figure 1. High-Level Depiction of Architecture 1**Architecture Features:**

- Architecture 1 simplifies maintenance as it has defined demarcation and distribution points for troubleshooting
- The DCM can provide a lossless video feed with redundancy and high availability
- Multicast deployment can be simplified especially if Source Specific Multicast (SSM) is used in the deployment
- Architecture 1 provides a flexible and open VDH architecture that offers multiple client options
- Architecture 1 can be provisioned for archival and on-demand services.

2. A FMV Multicast-Enabled Domain Architecture

Architecture 2 applies the same strategic goals as Architecture 1 without altering the physical DoD administrative domains. However, this approach is simpler to implement compared to Architecture 1 from an IP routing perspective, as this architecture would be provisioned as a single multicast-enabled network for transport and dissemination. The service provider would decrypt the video sources using PPK and then redistribute them through multicast to the SOF SIE through their redundant, distributed POP entry points. The SOF VDH within each POP would then function as it does in Architecture 1 by logistically networking the video feeds through the DCM for processing. Once the video feeds are conditioned and routed for authorized SOF clients, they continue to be delivered through multicast delivery methods. A high-level depiction of Architecture 2 is presented in **Figure 2**.

Figure 2. High-Level Depiction of Architecture 2**Architecture Features:**

- Architecture 2 provides efficiency and economies of scale for video distribution with multicast IGMP bypass enabled on the cryptographic equipment. The feeds would still be encrypted, but the delivery method provides an efficient process to distribute video across a global network architecture.
- The DCM can provide a lossless video feed with redundancy and high availability.
- Architecture 2 simplifies maintenance because it has defined demarcation and distribution points for troubleshooting.
- Secure video sources using SSM prevent rogue and unauthorized video sources.
- Architecture 2 is a flexible and open VDH architecture that offers multiple client options.
- Architecture 2 can be provisioned for archival and on-demand services.

Summary

FMV services support the warfighter across all theaters of operation. This consolidation is underway in the unified communications world, as is visible via the efforts of the various DoD working groups, as well as the successful Classified Voice Video over Internet Protocol (CVVoIP) program which supports communities around the globe.

The ISR program missions continue to grow in capabilities, and are driving a commensurate growth in demand for efficient, effective video distribution and delivery capabilities. These two architectural approaches highlight the opportunities available to DoD to establish a cost-effective, reliable, global video distribution capability for the COI.



Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

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