



## PERFORMANCE-RESPONSIVE, INTELLIGENT STREAM MANAGER (PRISM)

### THE CHALLENGE

Tactical data networks providing data support to the expeditionary service unit are commonly Disadvantaged, Intermittent, Low-Bandwidth (DIL) networks. These DIL networks are often strained by the load of high-bandwidth data (Sensor Data, C2 tracks and Coordination messages) transmitted across them. With each acquisition cycle, this problem is further aggravated as the size and frequency of this data increases at a rate exceeding the parallel improvements of the network. Rogue data sources that push unrealistic amounts of data onto the strained network often jam the pipe, preventing the flow of information and (worst of all) prevent administrative attempts to remotely terminate the offending data source and restore the network.

At the request of the Department of Defense (DoD), CSCI analyzed the tactical data networks in use during several Weapons and Tactics Instructor (WTI) classes held in and around Marine Corps Air Station (MCAS) Yuma, AZ. During that study, a significant focus was on the Full Motion Video (FMV) provided by the Unmanned Aerial Vehicles (UAVs) that support WTI exercises. During an iteration of the study, CSCI fielded a prototype service that analyzed the condition of a Satellite Wide Area Network (SWAN) connection and automatically adjusted the character of the FMV transmission to respond to changes in the SWAN connection.

The success of this effort led to a follow-on request by the DoD to further develop the PRISM concept and test it in a lab environment.

### THE STRATEGY

The PRISM system is modularized into three main components: a Network Interrogation Service (NIS), a Content Treatment Service (CTS) and a Content Management Service (CMS). When a request is sent to the NIS, it responds with a route “score” that identifies the available throughput and stability of the route. The CTS responds to requests to initiate, modify or terminate FMV streams. The CMS serves as the “brain” of the architecture, keeping track of routes between FMV sources and consumers,

regularly polling the routes and automatically adjusting the FMV encoding profile to keep the route open and optimize the usability of the FMV. To support rapid development and enable evolution of the technology, all three components were developed using a Service-Oriented Architecture (SOA) that relied on SOAP messages to connect the components. Two NIS implementations were tested, one based on Simple Network Management Protocol (SNMP) and the other leveraged Cisco’s Service Advertisement Framework (SAF) technology.

The system was prototyped in less than two months and deployed on a CENTOS-based laptop to lower the cost and enable the use of open-source technologies including Java, PHP and Video LAN Client (VLC).

For the analysis venue, the United States Marine Corps (USMC) offered their Marine Corps Network Efficiency Lab (MCNEL) where various network transmission systems could be simulated, network loads could be adjusted virtually and significant metrics on network utilization and performance could be collected and analyzed by their experts.

### THE RESULTS

The MCNEL team judged the PRISM system to be a success as it was capable of responding to changing network conditions and automatically adjusting the streaming content to keep the network healthy and to provide usable content to the end-user. They were particularly impressed by PRISM’s ability to even accommodate the 64kbps pipe available via a simulated EPLRS radio – delivering a low-resolution, low-bandwidth feed that was still tactically valuable. Another component that received significant praise was the “circuit breaker” capability – where the CMS would stop the FMV transmission when an NIS response was not received, permitting administrators to evaluate and administer the network instead of continuing to saturate the circuit and delay or prevent correction. The SOA approach was also proven a success when CSCI easily and quickly reconfigured the system to rotate between the SNMP and SAF-based NIS solutions during testing.



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