

12TH ICCRTS

“Adapting C2 to the 21st Century”

Title of Paper: "**Integrating Military and Civilian C2**"

Topics: Military and Civilian C2
C2 Technologies and Systems

Name of Author: John A. Sturm
Point of Contact: same
Name of Organization: NuParadigm Government Systems, Inc.
Complete Address: 16091 Swingley Ridge Road, Suite 160
Chesterfield, MO 63017
Telephone: (314) 401-6850
E-mail Address: jsturm@nuparadigm.com

Abstract

NuParadigm recently received a Navy SPAWAR Phase II SBIR Award called SLAIN for "Secure Legacy Application Integration with NCES" (and NESI as the Navy Enterprise Solutions for Interoperability within FORCEnet). As a result, we are developing prototype system models to integrate civilian and military command & control (C2) with end-end information assurance across an SOA environment. Web services and standards provide the promise of reliable, secure interoperability among disparate applications and technologies.

In reality however, the overhead associated with maintaining the message stream and the higher levels of abstraction required in web service communication make this promise difficult in systems of even moderate complexity. This is particularly pronounced when using an integration architecture that follows traditional centralized orchestration patterns. The challenge is maintaining security, performance, and reliability across disparate systems while minimizing the impact on service levels and the need for significant additional infrastructure investment. As a result of our Navy work, we will be addressing several fundamental issues that need to be solved for deployment of the GIG with full Information Assurance to support integrated C2 operations.

Brief Summary & Outline of Paper

Current Challenges

XML messages bear the burden of larger overhead data requirements, especially for the message state recognition that is necessary for maintaining security. This overhead includes:

- Transmission and receipt data
- Message validation data

- Authentication and authorization data
- Activity monitoring and auditing data
- Encryption & associated De-encryption processing and related Key Management

These overhead burdens become rapidly amplified as the number of concurrent instances grows to even moderate levels. Service areas that are affected by this model include:

- Performance – memory requirements grow exponentially, placing drag on the system
- Scalability – growth in this model imposes costly infrastructure requirements.
- Resiliency – offering seamless service plus audit reporting imposes greater restrictions on the granularity of security roles and data definitions supported due to the associated cost in processing and storage requirements.
- Federation – all overhead issues are magnified when the requirements for communication over disparate systems and technologies are introduced.

Solution Approach & Direction

NuParadigm's secure object framework introduces a next-generation solution by offering security, system continuity, and reliability in a unique way: NuParadigm routes objects through a Secure Context Object Routing Engine (SCORE) rather than routing messages through traditional transport channels. Object state data is maintained within the service object itself instead of as system overhead associated with processing the messages related to a service. Realized benefits include:

- Reliability – achieved through context specific object message constructs
- Security - validation, authentication, and authorization are directly managed within the object
- Object monitoring – object activity is directly captured within the object as it goes through the service cycle for audit and reporting purposes
- Efficient handling - unnecessary repetitive object handling and parsing is eliminated since the full context of the data object is maintained in one place

As a result, system performance is positively impacted as transaction overhead is dramatically reduced. Realized service improvements include:

- Performance - Service management overhead grows in direct proportion to volume rather than exponentially.
- Scalability - SCORE hubs are easily distributed. The inherent independence of service objects due to internal state maintenance makes this possible.
- Effectiveness – Finer security and data granularity with detailed activity tracking are readily achieved since the objects are not constrained in their ability to store the information required to achieve this.
- Synchronization - The independence of objects also allows for ease of implementation in asynchronous access models such as publish and subscribe.
- Resiliency - Object routing also increases attack prevention capability since all objects are easily validated or rejected within the secure object framework.
- Federation - SCORE hubs are able to retain necessary context translation definitions and transparently facilitate object transfer between domains.

Example for Presentation: Integrated Public Alert & Warning System (IPAWS)

NuParadigm has also received a contract from FEMA for development of the IPAWS (Integrated Public Alert & Warning System) functionality for the thirteen state hurricane risk area of the US. The IPAWS model shown below is under consideration by the Navy as part of their Maritime Domain Awareness (MDA) experiment in the Trident Warrior'07 Exercise next March:

