NCOIC White Paper

The MITRE Corporation
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***Purpose*:** The purpose of this white paper is to provide recommendations to the Net Centric Operations Industry Consortium (NCOIC) for assisting MITRE's Air Force (AF) sponsor, the Electronic Systems Center (ESC), to achieve the AF vision of Net Centric Operations (NCO). Additional recommendations are also provided for ESC/NCSW to achieve its mission and vision by working cooperatively with industry, and for MITRE to actively participate in NCOIC as a government partner to help develop a common understanding of Network Centric Operations and a way ahead for helping the Air Force realize its NCO vision.

***Background*:** The NCOIC was formed to establish and communicate a common understanding of NCO among its membership. Its mission is to help accelerate the achievement of increased levels of interoperability within, and among, all levels of government of the United States and its allies to facilitate NCO. Its primary objective is to enable NCO by identifying common, existing and emerging open standards, processes and principles, together with their patterns of use and interoperability. NCOIC member companies cover a wide range of programs across the government enterprise (DoD, IC and Agency) and can leverage its membership resources to help the government achieve its NCO vision.

Recommendations for NCOIC

Relationship With Existing Standards Bodies and Other Industry Consortia

In response to the DoD's vision to realize Net Centric Operations, several industry organizations, such as the Armed Forces Communications and Electronics Association (AFCEA), have refocused their goals to help the government achieve its vision, and several industry consortia in addition to NCOIC, such as the Association for Enterprise Integration (AFEI) and Net Centric Industry Forum (NCOIF), have been formed to this end, as well. We recommend that NCOIC develop an overview of all of the relevant inter-related industry associations and consortia, and describe how NCOIC will work cooperatively with these organizations to leverage the collective resources available through all of these organizations to help the government achieve its NCO vision.

As NCOIC pursues its objective to enable NCO by identifying common, existing and emerging open standards, it must work with existing, well-established national and international standards bodies, such as IEEE, W3C and WS-I, to influence the evolution of emerging open standards in support of NCO. In addition, NCOIC may conclude that new standards may also be needed to support the unique needs of the government applications. We recommend that NCOIC develop an overview of all of the relevant inter-related national and international standards organizations, and describe how NCOIC

will work cooperatively with these organizations to influence the evolution of emerging standards and/or propose new standards, as necessary, to help the government achieve its NCO vision.

ESC Net Centric Operations Strategy

ESC has developed a way ahead for Net Centric Operations and has adopted three key documents that articulate it's near term strategy. These include (1) Strategic Technical Plan (STP), (2) Net Centric Solutions for Interoperability (NESI) and (3) Enterprise Architecture Framework (EAF). The STP provides a common technical vision for ESC programs and identifies key metrics to measure progress. NESI provides implementation guidance to facilitate the design, development and usage of information systems for net-centric warfare. The EAF identifies various approaches, models, and definitions for communicating key architecture components and provides the overarching guidance for generating AF architectures. In concert with the Network Centric Operations/Integration Systems Wing (NCSW) of ESC, MITRE invites the industry to provide feedback on these documents and also invites the NCOIC to adopt these documents as a basis for implementing their NCO strategy and enterprise architecture framework.

DoD Net Centric Standards and Guidance

The DoD has developed Net Centric Standards and Guidance that identify what needs to be done (programmatically and technically) in order to migrate to a net-centric environment and enable programs to contribute to the development of the GIG. However, in order to accomplish this objective, the plethora of standards and guidance must be condensed and correlated to identify (1) a minimal set of standards and guidance and (2) duplicative, inconsistent and conflicting standards and/or guidance.

In concert with ESC/NCSW, MITRE invites the NCOIC to review and provide comments on the DoD vision, policy, directives, guidance, and instructions toward realizing the NCO vision for consistency, conflicts and gaps. The documentation which contains this information includes:

- DoD Joint Vision
- Key DoD policy, directives, guidance and evolving instructions, such as the Net-Centric Implementation Documents (NCIDs), Global Information Grid Enterprise Services (GIG-ES), Net-Centric Enterprise Services (NCES) and Transition to Net-Centric Environment
- Key AF architecture and standards positions, such as STP, NESI and EAF

In addition, NCOIC can help condense these standards and guidance into clear, concise and digestible form so that it becomes usable and meaningful to programs as they build or migrate to a net-centric environment. In doing so, the NCOIC may identify acquisition language, standards profiles and best practices for procurement and implementation of NCO capabilities and services.

Acquisition Strategy to Achieve Net Centric Operations

The architectural implications of a Network Centric Environment are an enterprise based on a Service Oriented Architecture (SOA). Today, many of our programs are focused on building "systems" vice "services" that provide capabilities that contribute to the evolution of the GIG.

In a "system-centric" acquisition environment there are clear lines of authority and funding that fosters a myopic view of the enterprise and lends itself to building stovepipes that do not interoperate. Conversely, in a net-centric acquisition environment there is no controlling authority and capabilities are delivered to the enterprise that will be dynamically interconnected to build out the GIG. The NCOIC can help ESC/NCSW by developing a portfolio of standard service profiles, and sharing lessons learned and best practices for developing interoperable NCO solutions. Additionally, NCOIC can help us in developing a phased approach to a net-centric acquisition strategy to migrate legacy systems into an NCO SOA-based environment.

Collaborative Environment for Test, Certification, and R&D

In order to achieve both horizontal and vertical interoperability in a net-centric environment, we need to migrate from “paper compliance” to “real world compliance”. “Paper compliance” (e.g., compliance with Net Centric Implementation Framework) does not necessarily ensure interoperability. In concert with ESC/NCSW, MITRE invites the NCOIC to develop a collaborative environment for realizing NCO Test, Certification and Validation criterion/capabilities by creating a secure industry-based NCO test infrastructure and a strategy to integrate this infrastructure with the government NIPRNET and SIPRNET infrastructures. Additionally, we would like the NCOIC to develop uniform system engineering processes, and modeling / simulation / demonstration techniques and laboratories in order to test, validate and/or demonstrate increased levels of interoperability.

Recommendations for MITRE

Government Partnership

In partnership with the Air Force, the Center for Air Force Command and Control Systems (CAFC2S) provides world class systems engineering for the development and acquisition of an integrated C4ISR system in support of joint Net Centric Operations. The CAFC2S leverages extensive command, service, and agency-specific knowledge and expertise into broader solutions that benefit sponsors across the DoD. As part of the MITRE DoD Federally-Funded Research and Development Center (FFRDC), the CAFC2S also serves as an integrating agent, across the DOD and broader national security community, to foster the achievement of an integrated, interoperable C4ISR system to support decision-makers and warfighters executing C2 capabilities, thereby enabling the DoD to achieve its NCO vision.

Given its unique role in serving the DoD and government in the public interest, MITRE should actively participate in NCOIC as a government partner and tier 3 member, and represent the vision of Net Centric Operations for both the AF and DoD, as necessary. Given its extensive command, service, and agency-specific knowledge and expertise, as well as its significant contributions to the development of the ESC Strategic Technical Plan (STP), Net Centric Solutions for Interoperability (NESI) and Enterprise Architecture Framework (EAF), MITRE can also make significant contributions to various technology Working Groups within the NCOIC Technical Council and can provide technical proposals for realizing NCO services.

In addition, MITRE has and will continue to make significant investments in the development of a wide range of Net Centric enabling technologies through the MITRE Technology Program (MTP) which should be leveraged and transferred to industry for the benefit of our DoD and government sponsors in realizing Net Centric capabilities. Through active participation in various technology Working Groups within the NCOIC Technical Council, MITRE can contribute a wide range of Net Centric enabling technologies and provide technical proposals for realizing NCO services.

Participation in the Architecture and Standards Analyses Team

The charter of the Architecture and Standards Analyses Team is to work with customers to develop a secure interoperability framework that enables increasing degrees of network-centric operations. Its key activities include the development of an NCOIC Interoperability Framework (NIF) to define the applications, data and communications elements required to design and evaluate network-centric systems with respect to interoperability, and the development of a Network Centric Analysis Tool (NCAT) to provide for a common basis to analyze architectures and initiatives.

MITRE has assisted ESC in developing a way ahead for Net Centric Operations and has contributed substantially to the development of the STP, NESI and EAF. Given its in-depth knowledge and experience in these areas, as well as its broad knowledge and experience as an integrating agent across the DoD, MITRE can help NCOIC gain an

accurate, in-depth understanding of the DoD vision for NCO and the way ahead which ESC as developed for achieving that vision for the Air Force. MITRE should actively participate in the Architecture and Standards Analyses Team in a leadership position and provide support to key Working Groups to jointly develop an industry/government enterprise architecture framework, reference model, and supporting tools and techniques which are consistent with the STP, NESI and EAF. Key Working Groups associated with this Team include:

- Interoperability Framework Working Group – to leverage MITRE experience with and foster the adoption of the STP, EAF and NESI
- Network Centric Analysis Tool Working Group – to leverage MITRE experience with the NCOW reference model, Net-Centric checklist and MOSA
- Open Standards and Patterns Working Group – to leverage MITRE experience with Open Standards and foster the adoption of the Node Information Services MOIE design patterns
- Services Information Interoperability Working Group – to leverage MITRE experience with and foster the adoption of the EAF and NESI

Participation and support may be required for new Working Groups as they are formed in the future from time to time.

Participation in the Engineering Process Team

The Systems Engineering Directorate within the CAFC2S and MITRE's Systems Engineering Program Office are composed of senior staff who have extensive knowledge and experience in enterprise systems engineering and complex systems for the development and acquisition of integrated C4ISR systems which support of joint Net Centric Operations. The charter of the Engineering Process team is to promote effective collaborative engineering environments, uniform system engineering processes, and modeling / simulation / demonstration techniques to test, validate and/or demonstrate increased levels of interoperability. Its key activities include the development of recommended Consortium Systems Engineering Processes, including use of tools, process models and maturity modeling techniques for NCOIC integration. MITRE should actively participate in this team to leverage the knowledge and experience of the Systems Engineering Directorate and Systems Engineering Program Office to jointly develop an enterprise systems engineering and complex systems body of knowledge, uniform system engineering processes, and modeling/simulation/demonstration techniques which will effectively support the needs of our sponsors.

Participation in the Education and Outreach Team

The Information Technology Directorate within the CAFC2S has developed and delivered a Net Centric Boot Camp curriculum and series of in-depth course materials to educate our technical staff on a wide range of topics related to NCO. Course modules included in the curriculum include:

- Application Integration and Workflow
- Enterprise Infrastructure
- Enterprise Information Assurance
- Enterprise Information Management
- Enterprise Decision Support
- Net Centric Fundamentals
- Performance Engineering
- Service Engineering
- Real Time Engineering

The Systems Engineering Directorate within the CAFC2S and MITRE's Systems Engineering Program Office have developed and delivered a number of traditional systems engineering and enterprise systems engineering courses, as well as tutorials and conference papers on complex systems engineering.

MITRE should actively participate in the Education and Outreach Team to jointly develop training materials, and contribute MITRE-developed course materials, such as the Net Centric Boot Camp courseware, to help NCOIC communicate a common understanding of NCO across its membership, as well as the industry at large.

Support for the Customer Requirements Team

The charter of the Customer Requirements Team is to conduct a rigorous analysis of pertinent government agency architectures, capability needs, and mandated open standards to identify commonalities, synergies, conflicts, gaps and potential areas for improvement. As mentioned earlier, MITRE has assisted ESC in developing a way ahead for Net Centric Operations and has contributed substantially to the development of the STP, NESI and EAF. Given its in-depth knowledge and experience in these areas, MITRE can help this team gain an accurate, in-depth understanding of the DoD vision for NCO, as well as the plethora of Net Centric Standards and Guidance that has been developed across the DoD to migrate to a net-centric environment. MITRE should provide support to this team, as required, to assist the team in its analyses of DoD requirements for realizing NCO.

Recommendations for ESC/NCSW

Net Centric Operations Strategy, Guidance and Standards

ESC/NCSW has invited the industry to provide feedback on the STP, NESI and EAF, and has also invited the industry to adopt these documents as a basis for implementing their NCO strategy and enterprise architecture framework.

In addition, ESC/NCSW has asked the industry to help condense the plethora of Net Centric Standards, Guidance and Implementation documents into clear, concise and digestible form so that it becomes usable and meaningful to programs as they build or migrate to a net-centric environment. In doing so, the NCOIC may identify acquisition language, standards profiles and best practices for procurement and implementation of NCO capabilities and services.

As the industry responds to these requests through NCOIC, we recommend that ESC/NCSW work with industry to develop policies, processes, best practices and guidance that will enable the realization of the NCO vision, capabilities and services.

Acquisition Strategy to Achieve Net Centric Operations

The architectural implications of a Network Centric Environment are an enterprise based on a Service Oriented Architecture (SOA). Today, many ESC programs are focused on building "systems" vice "services" that provide capabilities that contribute to the evolution of the GIG. In the future, ESC programs must focus on delivering Net Centric capabilities and services, rather than stand-alone “systems”.

ESC/NCSW has invited the industry to help facilitate the evolution to Net Centric capabilities and services by developing a portfolio of standard service profiles, and sharing lessons learned and best practices for developing and certifying interoperable NCO solutions. In addition, industry may also have suggestions towards implementing a phased approach to a net-centric acquisition strategy to migrate legacy systems into an NCO SOA-based environment.

As the industry responds to these requests through NCOIC, we recommend that ESC/NCSW consider adopting appropriate recommendations provided by industry into acquisition language as requirements for the procurement of NCO capabilities and services based on standard service profiles, migration strategies, and best practices for developing and certifying interoperable NCO solutions.

In addition, we recommend that ESC/NCSW adopt acquisition language and practices which assess contractor performance and provide incentives to contractors based on key outcomes which enable the realization of the NCO vision, such as

- Delivery of capabilities and services, rather than systems

- Use of the GIG infrastructure
- Reuse of NCO services and capabilities
- Agile designs which can easily incorporate new architectures and technologies
- Lower cost of integration and interoperation
- Faster deployment of capabilities

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