

NATO NEC C2 Maturity Model Overview

NATO Network Enabled Capability (NNEC)

NATO is committed to developing the capability to conduct network-enabled operations.¹ The ability to conduct such operations, referred to as NEC or network-enabled capability, is considered critical for mission success in the challenging complex civil-military operations that NATO will be participating in the twenty-first century.

The accumulating evidence points to the operational value of NEC. The competitive advantage of NEC derives from a value chain that begins with a robustly networked force. Such a force is better able to share information and collaborate, creating improved awareness and shared awareness. Shared awareness is the critical enabler of new approaches to Command and Control (C2) that promise to be more effective and more agile. Thus, Command and Control concepts and capabilities are critical to NNEC success. The new approaches required will differ in fundamental ways from traditional Command and Control.

Transforming traditional military organizations into network-enabled ones will require the coevolution of doctrine, organization, training and education, materiel, and approaches to Command and Control. This will take a considerable amount of time and effort. Therefore, it is important to define interim milestones on the road to NEC. NATO has defined five such milestones representing increasing levels of operational capability. Each succeeding level is related to increasing the coherence of the operation or endeavor.

These five levels, in increasingly degree of capability, are:

- stand alone (disjointed) operations
- de-conflicted operations
- coordinated operations
- integrated operations
- transformed (coherent) operations

¹ At their meeting in November 2002, in the weeks prior to the Prague Summit, the NATO C3 Board (NC3B) agreed that there was a need to develop a NATO concept to adapt national initiatives such as the U.S. Network-Centric Warfare (NCW) and the U.K. Network-Enabled Capability (NEC) to the NATO context. This NATO concept is referred to as the “NATO Network Enabled Capability” (NNEC). In 2003, nine NATO nations launched a 2-year feasibility study on Network Enabled Capability.

<http://www.nato.int/docu/pr/2003/p03-135e.htm>

SAS-065 is currently refining a C2 Maturity Model for NEC.

<http://www.rta.nato.int/search.asp#SAS-065>

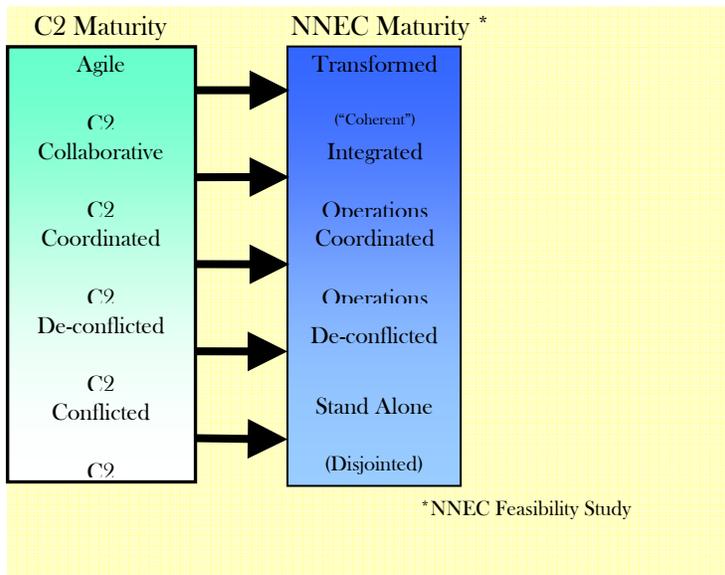
IST-045 is currently examining security issues associated with NEC.

<http://www.rta.nato.int/search.asp#IST-045>

IST-073 completed a 2007 project to study information security in NEC.

<http://www.rta.nato.int/search.asp#IST-073>

Increasing levels of C2 maturity are required to support these levels of increasing operational capability. The relationships between C2 maturity levels and operational capability levels are depicted in Figure 1 below.



NATO Research Study Group SAS-065

SAS-065² is a NATO research group operating under the auspices of the SAS Panel. It was formed in 2006 for the purpose of developing a C2 Maturity Model for network-enabled operations. SAS-065's principal products will include a detailed description of a NATO NEC Command and Control Maturity Model (NNEC C2MM) and a revised NATO Command and Control Conceptual Reference Model (developed by SAS-050). An initial draft of the Maturity Model is currently available. It is being tested using case studies of complex civil-military endeavors. A refined version is scheduled to undergo formal peer review in 2008. SAS-065 consists of representatives from the following NATO countries and organizations: Belgium, Canada, Germany, Italy, The Netherlands, Norway, Portugal, Slovakia, United Kingdom, United States, and NATO ACT. There are also representatives from Australia, Sweden, and Switzerland.

What is a Maturity Model?

A Maturity Model has the following essential properties:

- A Maturity Model identifies different levels of capability that are achievable.
- It is usually assumed that organizations, as they mature, will be able to achieve higher levels of capability.

² SAS-065 builds on the work of a series of research groups dating back to 1995 that have explored issues in Command and Control. These have included RSG-19 and SAS-026, which produced Codes of Best Practice for C2 Assessment, and SAS-050, which produced a C2 Conceptual Reference Model.

- Some Maturity Models map maturity levels to the degree of achievement and/or to the specific characteristics of a number of key variables.
- The maturity levels must be measurable.

What use is an NNEC C2 Maturity Model?

A Maturity Model is like a map; it helps you to determine where you are relative to where you want to go. It also identifies places along the way that are intermediate destinations on the journey to transformation.

When planning a journey, it is obviously important to first know where you and others that are participating in the journey are located relative to one another. A C2 Maturity Model provides a framework that can be used to assess the C2 capabilities of individual nations and collections of nations (and other coalition partners). This is the starting point.

Since increasing Command and Control capability is not an end unto itself, progress towards NEC requires that links be made between C2 maturity levels and levels of NNEC. The Maturity Model being developed by SAS-065 will establish these performance-related links.

Knowing where you are is not sufficient for the journey at hand. One also needs a roadmap that shows how to get to the next step along the way. A Maturity Model helps in this regard by identifying what is needed to move an organization, a nation, or a coalition from one level to the next. Thus, a Maturity Model can provide a set of milestones that can be used in NATO as well as national C2 and NEC planning.

The NNEC C2 Maturity Model also provides a set of metrics to measure progress. With an NNEC C2 Maturity Model in hand, NATO and member nations will be able to:

- Develop milestones using C2 Maturity levels
- Develop roadmaps and understand the relationships between and among NATO “desired capabilities” using what is needed to move to the next C2 maturity level
- Identify specific opportunities to improve effectiveness and efficiency of C2 organizations and processes
- Design experiments using the mapping of C2 approaches to C2 Maturity levels
- Prioritize investments in information and communications capabilities on the basis of mapping these capabilities to the C2 approaches they enable

NNEC and its associated Command and Control capability need to be analyzed and assessed in a realistic context. Thus, the nature and challenges of twenty-first century complex civil-military endeavors³ will provide the context for considering the implications of operating at each of the defined C2 maturity and NNEC levels.

³ As used by Alberts and Hayes, the term *complex endeavors* refers to undertakings that are distinguished by one or more of the following characteristics:

1. The number and diversity of participants is such that
 - a. there are multiple interdependent “chains of command,”

conflict their intents, plans, or actions they need to be able to recognize potential conflicts and attempt to resolve them by partitioning as a function of, for example, geography, function, and/or time. This involves limited information sharing and limited interactions. It does not require any changes in decision rights, although once a decision has been made to de-conflict it becomes a constraint on the entities. Thus a decision to de-conflict is not a distribution of decision rights but the making of a decision by a previously authorized entity.

Coordinated C2

The objective of Coordinated C2 is to increase overall effectiveness by (1) seeking mutual support for intent, (2) developing relationships and links between and among entity plans and actions to reinforce or enhance effects, (3) some initial pooling of non-organic resources, and (4) increased sharing in the information domain to increase the quality of information. Coordination involves more than an agreement to modify one's intent, plans, and actions to avoid potential conflicts. It involves the development of a degree of shared intent and an agreement to link actions in the various plans being developed by the individual contributors (elements or entities). This in turn requires a significant amount of information sharing (broader dissemination) and a richer set of interactions, both formal and informal (relative to those required for de-confliction) among those in the various elements that are involved in establishing intent and developing plans. While the interactions required may be quite frequent, they do not approach a continuous interaction. While operating at this level of maturity does not require any changes in the distribution of decision rights, it does require that decisions regarding entity intents and plans be constrained by shared intent and linked plans.

Collaborative C2

The objective of Collaborative C2 is to develop significant synergies by (1) negotiating and establishing shared intent and a shared plan, (2) establishing or reconfiguring roles, (3) coupling actions, (4) rich sharing of non-organic resources⁴, (5) some pooling of organic⁵ resources, and (6) increasing interactions in the cognitive domain to increase shared awareness. This maturity level involves more than "a degree" of shared intent; it involves the collaborative development of a single shared plan. The intents of the entities/elements are subordinated to shared intent. Entities may have other intents as long as they do not conflict with or detract from shared intent. Similarly entity plans need to be supportive of the single integrated plan. Entities operating at this level of C2 maturity accept symbiotic relationships and are interdependent. Very frequent interactions, indeed approaching continuous interaction between/among identified individuals/organizations, involving richer and more extensive interchange in both the information and cognitive domains are required to establish shared understanding and the development of a single plan. Once

⁴ *Non-organic resources* are resources not "owned" by participants. These include access to bridges and roads, and sharing of intelligence, surveillance, target acquisition, and reconnaissance information (ISTAR) and logistics.

⁵ *Organic resources* are those "owned" by a participant. These may include vehicles, weapons, and local supplies.

shared intent has been established and an integrated plan has been developed, entities are “delegated” the rights to develop supporting plans and to dynamically adjust these plans collaboratively. The real delegation that takes place here occurs with the selection of this approach to C2 and the delegation by the entities to the collective for shared intent and a single integrated plan.

Agile C2

The objective of Agile C2 is to provide the enterprise with additional C2 approach options that involve entities working more closely together and with the ability to identify and implement the most appropriate approach to coalition C2 given the situation (e.g., mission, conditions, and set of coalition partners/contributing entities). This level of C2 maturity distinguishes itself from the previous level with the addition of the option to self-synchronize as well as the ability to recognize which approach to C2 is appropriate for the situation and adopt that approach in a dynamic manner. The ability to self-synchronize requires that a rich, shared understanding exists across the contributing elements. This in turn requires a robustly networked collection of entities with widespread and easy access to information, extensive sharing of information, rich and continuous interactions, and the broadest distribution of decision rights.

Supporting Investment Decisions

Each of these maturity levels requires certain capabilities, affords some opportunities to operate more cost effectively and presents some mission risks. Any analysis of the costs associated with required capabilities, the potential benefits that opportunities afford, and the risks associated with operating at different levels of C2 maturity needs to be built upon a set of assumptions about the nature of the mission challenges—in this case the nature of complex operations. Thus, a decision to develop the ability to operate at a more mature capability involves a calculus that balances the projected costs and benefits in the context of the missions to be undertaken.

Way Ahead

SAS-065 is conducting an assessment of its initial version of the NNEC C2 Maturity Model using tools such as case studies, analyses, and experiments. This assessment will be followed by an international peer review of its methods and products late in 2008 or early 2009. Plans are being made to hold a Symposium in 2009 to explain and disseminate SAS-065 products.

SAS-065 welcomes participation from interested nations and NATO organizations during this testing and refinement period as well as in the peer review process.

Contact SAS-065

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