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Multi-Domain Command and Control

Providing a "working description" of the term Multi-Domain C2 (MDC2)

Background

The term "multi-domain" has been used in a multitude of ways to describe a concept that to this day remains open to interpretation, and subject to much debate. Whether it's multi-domain integration[1] or pan-domain operations[2] a concerted effort has been made to understand a new operational environment (OE) that has largely presented itself over the last 15 years. The ambiguity that exists in understanding this OE creates further complications that persist in the implementation of adequate and clear command and control (C2) structures that allow for a commander to express their intent and exercise authority.

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1   United Kingdom Ministry of Defense. Joint Concept Note 1/20. (2020)
2   Canadian Army. Advancing with Purpose: The Canadian Army Modernization Strategy. (2020)

A MULTI-NATIONAL COOPERATION

Understanding the constraints, the variables, and the methods to mastering this concept are of key importance not just to the NATO Command and Control Centre of Excellence (C2COE), but that of NATO.

Before untangling the issues surrounding multi-domain operations (MDO)[3] and the associated challenges in implementing effective multi-domain C2 (MDC2), it is first prudent to understand that NATO has operated in multi-domain OEs for many years. As recently as 2019, NATO officially recognized space as an operational domain[4] in addition to its previously recognized domains consisting of: land, air, sea, and cyberspace[5]. By this simple definition of operating domains it is easy for most military leaders to identify operations or exercises that have occurred in multi-domain OEs; frankly, it is more difficult to find instances of a single operation that has occurred in just one. The realities of a future security environment that involves the increased usage of cyberspace, and technology in addition to greater impact on operations from the social/societal sphere is readily apparent to NATO[6].

The difficulty in understanding C2 in MDO usually arises in identifying the boundaries of a domain like space and cyberspace and the inherent authority given to a mission commander. Many questions arise: Where do the bounds of cyberspace end? When do operations in air become operations in space? How do I synchronize various entities in this complex OE? For the purpose of this report, we will focus more on the C2 arrangements in this OE, and less on the physical and non-physical boundaries of the domains themselves.

This report serves to demystify conversations around MDO, to provide a workable definition of MDC2, and to provide prospective future steps that NATO and the NATO C2COE can take to ensure success in this environment.

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3   For the purpose of this report, the term MDO will be used in lieu of other terms previously discussed

4   North Atlantic Council. London Declaration. (3-4 December 2019)

5   Cyberspace as an operational domain was recognized recently (2016) at NATO's Warsaw Summit.

6   NATO. Framework for Future Alliance Operations. (2018)

Definitions & Concepts

Before delving into the definition of MDC2 it is first prudent to understand key terminology and concepts that comprise this conversation.

- Command and Control: "The authority, responsibilities and activities of military commanders in the direction and co-ordination of military forces and in the implementation of orders related to the execution of operations."[7]
- Domain: "Critical macro maneuver space whose access or control is vital to the freedom of action and superiority required by the mission."[8]
- Multi-Domain[9]: occurring in more than one domain.

It is important to note than when considering the concept of a domain, it is beneficial to understand domains beyond the standard NATO operational definition (i.e. land, air, sea, space, and cyberspace). From the recent NATO C2COE MDO webinar[10], the C2COE's, LtCol (NLD AF) Herbert de Groot, illustrated unique characteristics of domains that go well beyond the more simplified physical interpretations. He defined the characteristics as follows:

- Events (e.g. competition, conflicts and operations) take place in domains.
- Actors (e.g. NGO/GO individuals, single/joint military services) operate in domains.
- Actions (e.g. conventional, hybrid, kinetic, and non-kinetic) are performed in domains.

While not a characteristic of a domain, LtCol de Groot also made it clear that domains have their own inherent boundaries (which may overlap with others), location and nature, and that the events that occur in one not only effect its own domain's actions and actors but may also have follow-on influence on other domains' actors and subsequent actions.

It is also extremely important to not conflate ones understanding of joint with that of multi-domain. Joint is specific to the combination of two or more services (e.g. Army, Navy, etc.) while multi-domain focuses on the domains which can be comprised of the aforementioned services. Joint-ness as a term when inserted into the conversation of multi-domain is strictly concerned with the military instrument of power. The NATO C2COE avoids focusing on the joint aspect due to an ongoing effort to examine MDO and MDC2 from a comprehensive approach.[11]

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7   NATO Command, Control, and Consultation Board (NC3B). AAP-31(Edition 3), NATO Glossary of Communication and Information Systems Terms and Definitions. (2005)

8   Dr. Jeffrey Riley, OTH Journal. Beyond the Theory – A Framework for Multi-Domain Operations. (2018)

9   The next AJP-3 is the most likely place where a definition for MDO will be proposed. For the purpose of defining multi-domain, the NATO C2COE will defer to this definition in the interim.

10   Held 10 – 12 November, 2020. Webinar review available at: https://c2coe.org/download/nato-c2coe-c2-webinar-2020-multi-domain-operations/

11   NATO does not officially define "the" comprehensive approach. For the purposes of this report comprehensive approach refers to a holistic, PMESII-centric review process.

Additionally, an understanding of domains and multi-domain helps inform one about the operational environment. While comprehensive understanding of the environment (CUOE) is traditionally a component of operational planning and a function of intelligence preparation, it better helps to inform the NATO C2COE approach to understanding MDC2 due to its focus on factors outside the span of military actions and effects; it is referred to as follows:

- CUOE: *"Coherence in the planning and conduct of operations requires building / fostering a shared comprehensive preparation or understanding of the situation from the very beginning of planning and maintaining this understanding throughout the process. In order to support the commander's decision making process, we need to understand, but only to the best extent in the time available, the complexity of the operating environment and the linkages, strengths, interdependencies and vulnerabilities therein."*[12]

This speaks to a comprehensive appreciation for the operating environment that evolves from the beginning of an operation to its conclusion. Applying this to MDO, we reasonably make the conclusion that the domains that comprise multi-domain environment can evolve as actions are coordinated and as the actors change their own composition to meet the events taking place.

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12   Supreme Headquarters Allied Powers Europe. Comprehensive Operations Planning Directive (COPD) Ver. 3.0. (2021)

Defining MDC2

Before delving into the definition of MDC2 it is first prudent to understand key terminology and concepts that comprise this conversation.

- MDC2: The art of establishing and incorporating pre-existing organizational structures and processes, employed to identify and counter challenges and accomplish missions[13] to achieve objectives in a complex (and at times ambiguous) layered OE that may include, but is not limited to, other military actors, non-governmental organizations, and government agencies.

To best understand the NATO C2COE's definition of MDC2, it is best to analyze four key components that inform our viewpoint on this subject.

1. "...incorporating pre-existing organizational structures and process...": entities orpersons may come into a multi-domain system with their own C2 structures (i.e. composition) and processes (e.g. battle rhythm, CIS, etc.), and successful integration is predicated on adapting those into a new system without fundamentally changing their operating procedures; the final C2 system may be a system-of-systems.
2. "...achieve goals and objectives in a complex (and at time ambiguous) layered[14] OE...": the OE is defined in order to achieve desired effects with the resources at hand; domains are inherently complex due in large part to overlap, the non-physical nature of some (e.g. cyberspace, electromagnetic spectrum), and the impact of effects on non-military actors.
3. "...not limited to, other military actors, non-governmental organizations, and government agencies.": As previously referred to, the NATO C2COE uses a comprehensive approach to analyze MDC2 and as a result the domains contained within this concept are more than just military units and organizations. As such, concepts like joint all-domain operations (JADO)[15], and joint all-domain command and control (JADC2)[16] are helpful in identifying keys to improving MDC2, but comprise a small part of the wider understanding required for MDC2.
4. Additionally, it is important to note that MDC2 is not solely about acting in different domains, it is also concerned with the management of effects; both the effects of one's own actions in their influence on the objectives of other actors and vice versa.

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13 Adapted from C2 definition: "set of organizational and technical attributes and processes ... [that] employs human, physical, and information resources to solve problems and accomplish missions". Vassilou, Marius, David S. Alberts, and Jonathan R. Agre. C2 Re-Envisioned: the Future of the Enterprise. (2015)

14 Layered in this definition can refer to physical, social, and cyber layering, but also refers to the ambiguous boundary setting of domains like space and cyberspace, and the tendency for the traditional domains to overlap.

15 Joint Air Power Competency Centre (JAPCC), Inside the JAPCC (Journal Edition 31). NATO Joint All-Domain Operations. (2021)

16 Congressional Research Service. Joint All Domain Command and Control (JADC2). (2020)

Across the Landscape

In 2020, the NATO C2COE held an online seminar (webinar) to discuss theories around multi-domain operations. While the conversation surrounding MDO, and to a larger extent MDC2, are by no means settled, many commonalities have been noted, and are instrumental in informing the NATO C2COE's stance on MDC2.

- Dr. David S. Alberts, lead for SAS-143[17], gave remarks related to MDO, but in the case of his committee, the exact terminology and lingo differentiated, but arrived at very similar conclusions as other speakers at the recent webinar. According to him, MDO requires a comprehensive, whole-of-government approach. Entities in his estimation, may manage themselves, may even use different terms to describe their individual processes, but success in this "C2 approach space" is predicated on "harmonization" of these entities. Another key component of his theory is in C2 Agility Theory where the appropriateness of the approach is a function of the mission and changing circumstances (i.e. C2 structures and processes have to be adaptive). [18]

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17 SAS-143 is a NATO Science & Technology Organization (STO) research task group that currently studies agile domains on behalf of NATO.

18 Dr. David S. Alberts. Webinar read-ahead, https://c2coe.org/download/seminar-2020-read-ahead-dr-alberts-operations-in-multiple-domains/ . (2020)

- LtCol (USA AF) Henry Heren of the JAPCC, spoke on many different aspects of MDO, but really took his time to stress the need for arriving on common definitions, specifically for the term, domain. He recognized that terminology varies amongst nations and for a pact like NATO comprising 30 different nations and ideologies, it is not beneficial for future success. While LtCol Heren recognized some key differences across nations[19] he also clearly noted the need for a separate/special form of C2. One last key point that stood out from him, was that he recognized that integrating a new way of conducting C2 may be more difficult than instituting new technology[20].
  - Evolving delegation of authority to meet this complex landscape begins to speak to concepts like mission command.[21] Deconsolidated command authority will not only require understanding of one specific commander's intent and mission but understanding of other commanders and non-military, organizational leaders.
- Dr. Johann Schmid of the European Centre of Excellence for Countering Hybrid Threats, used his time to speak on the often forgotten but still relevant, hybrid warfare. To Dr. Schmid, if you understand the MDO from the perspective of a comprehensive approach you will understand hybrid warfare. Hybrid warfare is more than a military-centric approach to understanding your environment, but as expressed by Dr. Schmid, a comprehensive multi-domain situational awareness is a necessary precaution for effectiveness in this concept.[22]
- Lastly, Col (GBR RM) Al Livingstone of the UK's MOD think tank, the Developments, Concepts, and Doctrine Centre (DCDC) made the distinction that the UK recognizes different domains than NATO, but the key distinction for the UK is in how to synchronize forces and actions in each domain. The UK DCDC believes that a robust command, control, communications, computers, intelligence, surveillance, targeting, acquisition and reconnaissance (C4ISTAR) system is needed for cohesion and synchronization within MDI[23], and not MDO[24]. While not the only component of MDC2, robust, agile C4ISTAR is a key component that aids commanders in MDOs.

19 Specifically, the US DoD identifies joint all-domain as land, air, maritime, cyber, space plus the electromagnetic spectrum. This approach does not clearly differentiate between services and domains.

20 LtCol Henry Heren. Webinar read-ahead, https://c2coe.org/download/seminar-2020-read-ahead-lieutenant-colonel-heren-japcc-inconceivable-mdo-expanded/ . (2020)

21 Mission Command: "the conduct of military operations through decentralized execution based upon mission-type orders." Deployable Training Division Joint Staff J7. Insights and Best Practices Focus Paper: Mission Command. (2020)

22 Dr. Johann Schmid. Webinar read-ahead, https://c2coe.org/download/seminar-2020-read-ahead-dr-johann-schmid-hybrid-warfare-operating-on-multidomain-battlefields/ . (2020)

23 MDI in the case of the UK DCDC is not entirely dissimilar from the US' JADC2 approach in that it focuses cohesion in this space on a robust C4ISR/C4ISTAR system for integration of services.

24 Col Al Livingstone. Webinar review (pg. 44), https://c2coe.org/download/nato-c2coe-c2-webinar-2020-multi-domain-operations/ . (2020)

While many other speakers gave lectures on various efforts related to understanding MDO, and consequently, MDC2, the speeches outlined above best represented the NATO C2COE's own analysis of this concept. With all that said, the following key takeaways and components are key to understanding MDC2 now and developing the concept adequately into the future:

- New, agile C2 arrangements are needed for MDC2.
- Understanding the OE of a multi-domain operation is only truly possible through a comprehensive approach.
- While joint helps us understand actors within domains, it is not sufficient for understanding of a multi-domain OE.
- Proper alignment and construction of MDC2 structures and processes is a prerequisite for success in MDO.
- Success in MDO requires synchronization across NATO of terminology, understanding, and expertise to achieve true interoperability.
- A focus on domain boundary drawing isn't a prerequisite to effective MDC2, but it is helpful.
- New technology is not needed for effective MDC2, current technological enablers are sufficient.[25]

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25 The NATO C2COE presented part of its MDC2 concept at the MDC2 track of TIDE Sprint 2021 (13 April 2021), and a common takeaway from participants was that NATO does not need new technology to operate in MDOs. Alignment of process and training and how to effectively use the tools already available within "toolbox" is of much greater importance.

Recommendations

Moving forward, it is clear to the NATO C2COE that more work is required to fully understand and appreciate the challenges surrounding MDC2. The NATO C2COE recommends seven actions and efforts to assist with this concept development.

1. Continue to contribute to SAS-143 study regarding C2 Agility Theory.
Principally, MDC2 is focused on the C2 structures and processes that assist commanders in orientating on and eventually operating in a complex OE. A natural next step is to develop a methodology for building highly adaptive C2 structures, in accordance with individual process rather than domain boundary drawing. Currently, the NATO C2COE provides feedback on ongoing SAS-143 work regarding C2 Agility Theory. Continued work within this concept development is key to success and consistency in understanding of MDC2.

2. Continue to monitor and incorporate developments from JADO and JADC2 concepts into MDC2.
While the ongoing work of NATO C2COE is less focused on a purely joint approach, coordination with the JAPCC for awareness of the JADO concept, and possible implementation into the MDC2 concept framework is beneficial to both parties.

C2 arrangements in a joint environment enable joint operations, while C2 arrangements in a multi-domain environment support MDOs.[26] Given JADO's focus on operations vice C2, a shift to greater understanding of the US' JADC2 concept would be beneficial to informing MDC2.

3. Create framework for NATO mission command in support of MDC2.
It's clear that new C2 arrangements are needed to achieve successful actions within MDO. It is not entirely clear if there is one exact C2 arrangement that best fits MDC2, but a starting point for exploration is mission command. By exploring the idea of deconsolidated authority, a future C2 structure that is agile enough and clear enough to leaders in a multi-domain environment will enable future operations success. In summation, start research and analysis of mission command to formulate a framework for a real representation of working MDC2 practices.

4. Continue support to Federated Mission Networking (FMN) to align this effort with MDC2 and vice versa.
The conclusions of both the UK DCDC's MDI concept and the US DoD's JADC2 concept both arrive at a need for a resilient to C4ISTAR/ C4ISR system. The NATO C2COE recognizes the implementation of these systems as a part of the "how" in establishing resilient, agile C2 structures. While there is merit to both approaches, the current progression of FMN represents an active effort that incorporates a more realistic multi-national, varied environment. The NATO C2COE is currently active in an observer role within the FMN Operational

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26 Theoretically, in joint only operations, JADC2 and MDC2 operations can be exactly equal to one another. When this occurs the span of JADO and MDO would be also exactly equal to one another.

Coordination Working Group (OCWG)[27], and provides advice on operational requirements related to C2 practice at the operational level, C2 theory and NATO C2 doctrine. The efforts of FMN in our estimation provide the clearest target to a C4ISTAR/C4ISR C2 system.

5. Collaborate with Cooperative Cyber Defence (CCD) COE, JAPCC, and eventually Space COE to more accurately define cyberspace and space domains.

While not discussed at length in this report, future study of authorities within the cyberspace and space domains is beneficial towards development of the MDC2 concept. Working alongside the NATO CCDCOE[28] to define cyberspace boundaries could assist future commanders in better understanding what their role is (if any) in managing, and directing effects in this domain. Additionally, the JAPCC[29] could be a collaborative partner for defining space boundaries and the associated command authorities of a commander in that domain.

6. Update and align doctrine across NATO as it relates to MDO and MDC2.

As expressed by many speakers during the 2020 NATO C2COE Webinar, the misalignment of doctrine and terminology will lead to misunderstanding of MDC2 and MDO. Currently, Allied Joint Publication (AJP)-1 mentions MDO, but continued review of and contribution to this NATO doctrine is key for future understanding. In the future, contributions on MDC2 and MDO in AJP-3[30] would also be beneficial to bridging the delta in understanding MDO and MDC2.

7. Introduce and train on MDC2 and MDO terminology and concepts to NATO School Oberammergau (NSO) and to NATO exercise participants, specifically the Joint Warfare Centre.

Lastly, in addition to continued support to NATO policy/doctrine, training is the next big milestone for bridging the information divide. NATO C2COE currently participates as a C2 SME in both the NATO Comprehensive Operations Planning Course as well as the NATO Command, Control, and Consultation (C3) Course at NSO. Adapting our curriculum to incorporate conversations and considerations towards CUOE and MDC2 would greatly assist in introducing the concept to a wider audience. Also, reaching the widest audience via integration into exercise planning at the Joint Warfare Centre (JWC) would assist in broadening understanding of these concepts.

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27 For further information regarding NATO C2COE work in FMN: https://c2coe.org/podcast/s1e1-federated-mission-network-fmn-ltc-frank-gubbels-nld-n-mc/   . (2020)

28 In 2020 the NATO C2COE and NATO CCDCOE collaborated to explore preparation of cyberspace, specifically a cyber-command. The results of this finding are found in the following link: https://ccdcoe.org/library/publications/teaming-up-in-cyber-command/ .

29 Important to note that the recently approved Space COE in Toulouse, France could be another partner for collaboration on this effort.

30 The AJP-3.19 (Allied Joint Doctrine for Civil-Military Cooperation) would be another worthwhile place to make mention of MDC2.

Vision Statement: MDC2

In 5 – 10 years, a NATO commanding officer will be able to seamlessly integrate into a complex, layered OE with a strict focus on how they fit into the system in relation to other known entities, who they support, and who supports them. Their understanding is of those military actors, and non-military actors involved in achieving effects under a common understanding of mission and their commander's intent whilst adhering to an adaptive C2 structure.

Disclaimer

About NATO C2COE

The Command and Control Centre of Excellence C2COE (NATO C2COE) was established in 2007 on the initiative of The Netherlands. The aim was to create a group of C2 Subject Matter Experts supporting the transformation activities of Supreme Allied Commander Transformation (SACT) and of the Sponsoring Nations of the NATO C2COE (Germany, The Netherlands, Slovakia, Spain, Turkey and the USA; Estonia joined as the latest member in 2013). The NATO C2COE supports NATO, nations, and international institutions/ organizations with subject matter expertise on C2. NATO C2COE catalyses C2 by capturing, creating, assessing, and distributing C2 knowledge. The joint and multinational capacity of NATO C2COE and its partners will lead to robust and applicable knowledge.