

Principles of Multi-Domain Operations

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"A Combatant Commander must be able to create effects from any single domain to targets in every domain in order to fight tonight and win. - That means the Army's got to be able to sink ships, neutralize satellites, shoot down missiles, and hack or jam the enemy's ability to command and control its forces."¹

Multi-domain operations (MDO) aim to address the challenges of modern conflict and warfare, ranging from competition to rapid surprise operations and full-scale armed conflicts. The goal of MDO is to gain advantage over peer adversaries by integrating operations and actions simultaneously across multiple domains, targeting key enemy capabilities, and executing operations faster than the adversary. The converging effects produced by MDO are intended to paralyze the adversary's ability to act effectively and enable the achievement of one's own objectives.

This research bulletin is based on the report "Multi-domainoperoinnin periaatteet (*Principles of Multi-Domain Operations*)". The report examines the principles and solutions presented by NATO and selected NATO members' MDO concepts and identifies opportunities and preliminary options for developing Finnish MDO principles.²

General Framework

MDO is interpreted in various ways. Different actors emphasise different aspects across all levels of command. While many approaches remain conceptual, the U.S. Army is actively building MDO capable forces. Multi-domain operations represent a broad spectrum of layered cross-domain synergy from the kill-web system to strategic-level cooperation.

The foundation of multi-domain operations has evolved from network-centric operations and effects-based approach to operations, influenced by the US military's AirLand Battle -doctrine. These operational doctrines were applied in the Gulf War in 1991, after which peer adversaries, such as Russia and China, have developed their capabilities to counter US military superiority.³

The conceptual and practical development of US multi-domain operations is significantly ahead of NATO. The US military has established operational and tactical principles, adapted training systems, and equipped forces with necessary capabilities. NATO's development has been conceptual, and practical application has been slow due to the complexity of development processes and the varying capabilities of member states. MDO is a part of the evolution of warfare and technological development. It represents a response to changes in the threat environment. MDO concepts examined in the study form a comprehensive view from strategic-level principles to lower tactical level examples. For example, NATO's concept spans the full spectrum from national instruments of power (IoP) to the multidimensional engagement space. However, this broad scope poses challenges for clear applications across all levels of command, critical for a cohesive Finnish MDO concept. The principles of unity, interconnectivity, creativity, and agility, highlighted for developing NATO's deterrence and defence capabilities, are suitable as general principles for different levels of operations but do not provide solutions. They can be considered general principles and goals for FIN MDO development.

The US MDO concept emphasises the land power perspective. The scope of the US global operating environment affects the variation of MDO principles from strategic to tactical level The Army enables the deployment of joint forces by using MDTF (Multi-Domain Task Force) to neutralise the adversary's A2/AD capabilities.

NATO's objective for multi-domain operations by 2030 is based on advanced information and data infrastructure, interoperability, automation supported decision-making, and the ability to operate in space and cyberspace in addition to traditional domains. With this comprehensive approach, NATO aims to develop readiness to respond to future complex security challenges as part of NATO's deterrence and defence posture. NATO sees data-centric approach, advanced interoperability, rapid decision-making, integration of space and cyber environments into operations, and cooperation among allies as key enablers of multi-domain operations.

Multi-Domain Operations (MDO) / Joint All-Domain Operations (JADO) represent modern warfare based on the integration of weapons systems and critical data sources using the simplest possible solutions. Commanders should be able to anticipate the adversary's intentions and to disrupt and neutralise the adversary with effective use of capabilities. The future engagement space requires interoperable solutions that accelerate the decision-making capability of a joint force headquarters and the alliance in a contested operational environment.⁴

Threat – From Strategic Competition to Armed Conflict

Western MDO concepts identify several types of threat scenarios. The first is strategic competition—a phase of continuous rivalry and challenge where all instruments of power (Diplomatic, Information, Military, Economic, DIME) are employed to achieve political objectives.

Berlin, p. 8,

https://www.bundeswehr.de/resource/blob/5753418/11123cfdc6a7117559 625ae08cec7b31/brochuere-engl-data.pdf, accessed 17.3.2025. ⁴ Kahn Mark & Thatcher Sean (2020), *Integrated Joint All-Domain Operations (JADO) Collaboration Strategy*, White Paper, Lockheed Martin, p. 1, https://www.lockheedmartin.com/content/dam/lockheedmartin/aero/documents/mdo/Integrated_JADO_Solution_Whitepaper.pdf.

¹ Mroszczyk Joe L.C. (2024), *Multi-Domain Effects Battalion*, Military Review Space & Missile Defence, p. 97,

https://www.armyupress.army.mil/Portals/7/military-

review/Archives/English/March-2024/Multi-Domain-Effects-

Battalion/Multi-Domain-Effects-Battalion-UA.pdf.

 $^{^2}$ FDRA Report AV13358 / 30.4.2025: Multi-domain-operoinnin periaatteet. FIN Restricted.

³ Bundeswehr Office for Defence Planning (2024), *Multi-Domain* Operations for the Bundeswehr. A Short Introduction., Bundeswehr,

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According to NATO's AJP-01, war is a mean to achieve strategic and political ends. The use of military force is part of a state's broader set of instruments of national power. These instruments are categorised under the DIME framework:

- Diplomatic: Official state interactions and negotiations to promote interests and resolve disputes non-violently.
- Information: Strategic communications, information management, dissemination across platforms, and influence operations including cyber warfare.
- Military: Use or threat of armed force, whether directly (combat operations) or indirectly (deterrence, exercises).
- Economic: Trade policy, sanctions, or development aid as tools of influence.5

The second threat scenario includes rapid and limited operations, such as surprise occupation of a limited area or a constrained armed conflict. MDO concepts describe this as isolating the area of operations using all dimensions of the engagement space - referred to as "Layered Stand-Off." Emphasising a strong peer adversary in the concepts also fits the threat of full-scale warfare.

A peer adversary aims to challenge the US military operations by forming a multi-layered stand-off zone with a wide range of capabilities.6 "Layered Stand-Off" describes Anti-Access / Area Denial (A2/AD) operations, which consider the use of all instruments of national power in addition to A2/AD capabilities. The adversary aims to prevent military access and force projection to the area of operations (isolation). At the strategic level, the aim is to deny decision-making related to military operations and the unity of allies.

The MDO concept was developed by the US Army to meet the requirements set by the National Defense Strategy published in 2018⁷. The strategy shifted the focus of national security from global counter-terrorism operations to the challenge posed by military powers such as Russia and China.⁸ After and as a result of the Crimea annexation operation, the development and use of the US military have been guided by views on operations against a peer adversary⁹.

According to the US perspective, in the future operating environment, peer adversaries will have both global presence and capabilities for support and combat operations. The performance of adversaries' weapon systems will significantly improve in terms of range, speed, accuracy, and effect. Free and unchallenged areas are rare. Even the US territory is not a safe haven, which challenges the concentration and deployment of forces.¹⁰

⁶ TRADOC (2018), The U.S. Army in Multi-Domain Operations 2028, Pamphlet 525-3-1, United States Army Training and Doctrine Command, p. iii, https://adminpubs.tradoc.army.mil/pamphlets/TP525-3-1.pdf. 7 Feickert Andrew (2021), Defense Primer: Army Multi-Domain

NATO's horizon scanning and the determination of indicators and warnings (I&W) create the conditions for monitoring threat actors and the security environment. Monitoring produces assessments of the development of potential adversaries' military capabilities and methods, as well as factors affecting the security environment. Assessments provide the basis for NATO's defence planning process (NDPP) and the Deterrence and Defence of the Euro-Atlantic Area (DDA) plan.11

General Principles – Unified Data-Centric Agility

The principles of multi-domain operations are categorised in this research bulletin using different levels of command. A summary of categorised principles is presented in Figure 1. Some principles are identified as general principles that practically reflect any level of command. These principles generally describe multi-domain operations and serve as general guidance for its development.

NATO's MDO concept mentions four key principles, which enable the application and development of multi-domain operational principles in NATO and its member states. The principles are unity, interconnectivity, creativity, and agility. Data-centric approach and related factors are also emphasised in NATO's concept, as well as in many national concepts.¹²

The US Army is developing a C2 system that connects all sensors and weapon platforms participating in the same operation to the same network. This supports the development of a common "Kill-Web". Connecting systems from all domains to the same network supports the formation of a comprehensive situational understanding at all levels of command.¹³ This network must be extended to a command element with sufficient execution authority.

Other general principles of multi-domain operations are operational tempo and continuity, information superiority, network-centric approach, shared situational understanding, and integration of levels of command. Additionally, the Multinational Capability Development Campaign (MCDC) study has identified principles guiding multi-domain operations or its development, which the US military has stated it supports. The identified principles are shared understanding, unity of effort, dynamic posture, agility, and innovation. These principles enable an effective MDO approach and development of capabilities, structures, and standing operating procedures (SOP).14

⁵ Tähtinen Janne (2024), Sotilaallinen paha päivä. Venäjän 2000-luvun sotatoimien vaikutukset suomalaiseen sodan ja taistelun kuvaan sekä Suomen sotilaalliseen puolustukseen, Finnish National Defence University, Helsinki, p. 65; The Lightning Press (2024), Understanding the Instruments of National Power, https://www.thelightningpress.com/understanding-instruments-national-power/, accessed 25.4.2025

Operations (MDO), Congressional Research Service (CRS), passim, https://sgp.fas.org/crs/natsec/IF11409.pdf. See also Townsend Stephen (2018), Accelerating Multi-Domain Operations – Evolution of an Idea, Military Review Online Exclusive, passim, https://www.armyupress.army.mil/Portals/7/Army-Press-Online-

Journal/documents/Townsend.pdf.

⁸ Feickert Andrew (2021), passim. See also Multinational Capability Development Campaign (2022), Multi-Domain Multinational Understanding., Annex A, MCDC, p. A-34.

⁹ TRADOC (2018); Kahn & Thatcher (2020); Predd Joel, Schmid Jon, Bartels Elisabeth et al. (2021), Acquiring a Mosaic Force. Issues, Options, and Trade-Offs, RAND Corporation, California, p. xi, https://www.rand.org/content/dam/rand/pubs/r.

¹⁰ Jones Marcus A. & de Leon Jose D. (2020), Multi-Domain Operations - Awareness continues to spread about the importance of operating in multiple domains, The Three Swords Magazine, (36), p. 3-4, https://www.jwc.nato.int/application/files/5616/0523/5418/issue36_08lr.p df.

¹¹ NATO (2021), NATO Warfighting Capstone Concept, Allied Command Transformation. ¹² Cannon, Shaun (2024), *The Alliance's Transition to Multi-Domain Op-*

erations, Journal of Joint Air Power Competence Centre (37). https://www.japcc.org/articles/the-alliances-transition-to-multi-domainoperations/, accessed 29.4.2025. "Unity is as important for MDO as it has been for joint or coalition warfighting, and for delivering a comprehensive approach while emphasizing the criticality of information sharing. Interconnectivity enables the exchange of data and information to build understanding, whether or not the tactical units are interoperable. Creativity is what staff and commanders will need in order to build blended multi-domain warfighting options and to appreciate what data may be available to support military activity. Agility focuses on improving speed, from tactical resupply to strategic understanding.

¹³ Rozman Jeremiah P. (2020), Integrated Air and Missile Defense in Multi-Domain Operations, SPOTLIGHT 20-2, p. 5.

¹⁴ Multinational Capability Development Campaign (2022), Annex A, p. A–34.



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Figure 1. Summary of different actors' MDO principles.

Strategic Level Principles – Comprehensive Approach to Warfare

Comprehensive approach (DIME), integration of armed forces with governance, alliance and other actors, and collaboration are identified as strategic level principles. For example, the UK MDI (*Multi-Domain Integration*) aims to integrate military operations with governance, allies, and partners in the 2030s and beyond¹⁵.

At the strategic level, the use of all instruments of power (DIME) should be collaborated nationally and with the alliance and partners. The activities of government, the security authorities and private (civilian) actors are collaborated nationally and with the alliance and partners. Military strategic objectives are synchronised in a multinational framework. At the strategic level, a shared situational understanding of the strategic operating environment is formed.

NATO aims to expand the comprehensive approach by deepening the integration of political, military, and civilian actors' capabilities¹⁶. From NATO's perspective, the goal is, in addition to the integration of the multidimensional engagement space, to enable the goal-oriented cooperation of the instruments of national power and various actors of governance and private sector as part of NATO's activities and operations. The coordinated activities of the instruments of national power form the basis for the planning and execution of the military instrument.

At the military strategic level, the planning and development of capabilities (strategic planning, defence planning) and the use of capabilities (operational planning) are coordinated using the same structures and methods (threat scenarios, operational design, decisive conditions, operational effects, operational activities, and tasks/capabilities). At the military strategic level, the doctrinal foundation between the alliance and national actors is also unified. It is essential to develop and harmonise the methods of operational and strategic level planning. This enables the cohesion of operational planning concerning strategic objectives. It also enables the development of capabilities that supports the activities needed in future operations. The goal is a coherent planning system between different levels of command.

Operational Level Principles – Orchestration of Actions in All Domains and Synchronisation of Non-Military Actions to Enable Convergence

Operational level principles include orchestration (military actions), synchronisation (non-military actions), and (strategic) force posture. The planning and command of joint operations and combined operations are carried out at the operational level.

The use of forces and capabilities of the necessary domains are orchestrated and optimised, considering the enablers of the operation to achieve decisive combined effects (convergence). The leading domain for the planning and execution of tactical joint operations is also determined and the use of common resources is allocated. Sufficient expertise in "new domains" and non-kinetic capabilities should be ensured at different stages of planning and a common understanding of the operating environment should be formed.

At the operational level, the use of capabilities and forces of all domains and non-military actors are orchestrated and synchronised into one coherent integrated structure in accordance with the strategic level principles. According to the MDO approach, this achieves convergence, i.e., the combined effect of different actions in the physical, virtual, and cognitive effect dimensions.

¹⁵ Ibid, p. A-32.



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Figure 2. NATO domains where actions are carried out to produce effects in the Effect Dimensions.1

The US Armed Forces' Joint All-Domain Operations (JADO) comprehends air, land, sea, cyber, and space domains, as well as the electromagnetic spectrum. The actions carried out in multiple domains in a joint operation are integrated in planning and synchronised in execution with speed and scope that enables achieving an advantage and accomplishing the mission.¹⁸

The JADO vision for joint operations is convergence through all domains, i.e., the synchronisation and integration of kinetic and non-kinetic capabilities to produce lethal and non-lethal effects, the combined result of which is more significant than unsynchronised actions. The planning and targeting cycles of domains and the electromagnetic spectrum are synchronised at the operational level (Figure 3). The integration and synchronisation of targeting and planning are based on operational objectives. To maintain the operational tempo at all levels and in all domains, flexibility is required to identify new opportunities and to make quick decisions for effects.19

Concentrating effects requires the coordination of separate planning rhythms and the availability of resources. This ensures that forces and capabilities are available in the right place and at the right time to produce the desired effects. All participating forces must understand the operation and movement plan and the role of the forces as part of the overall operation.²⁰

The focus of the UK MDI concept is the integration between domains, which is seen as a prerequisite for success in the operational environment. The MDI concept represents the evolution of joint operations to an era where modern manoeuvre warfare, in any domain, seamlessly utilises effects produced from all other domains.21



Figure 3. The figure shows the synchronisation of the planning cycles of different domains and actors, enabling convergence, i.e., combined effect.22

The key principle of the US MDO concept is force posture, which also emerges in the principles used by other countries. The principle of dynamic force posture is also used when emphasising the ability to respond to changes in the operational environment and strengthen deterrence.

Force posture refers to the combination of forces and capabilities and their formations. With force posture and its changes, it is possible to operate actively in the manner required by the operational environment and its changes.

According to the US concept, in the continuum of competition, the army provides capabilities to shape the operational environment. The army has an adaptive force posture that can support the joint operations headquarters and political objectives. This is achieved by expanding the Global Landpower Network with allies and partners. The army is developing capabilities, force structure, doctrine, and training activities to support multi-domain operations. Demonstrating the ability to project power can increase the credibility of military deterrence, enabling decision-makers to utilise diplomatic, economic, and informational means to prevent and, if necessary, resolve the conflict.23

Tactical Level Principles – Cross-Domain Synergy and Multi-Domain Forces

At the tactical level, the use of capabilities and forces is synchronised and integrated in tactical level joint operations (cross-domain, multi-domain), utilising a shared situational awareness of the operational environment and supplementing the situational picture with information of one's own domain.

Tactical level joint operations enable agility and speed in the planning and execution of multi-domain operations. In tactical level joint operations, the operational level headquarters only defines the objectives and resource allocation as well as the leading domain. The commander of the designated leading domain has full operational freedom in planning and executing the operation. The other domains support the leading domain with all necessary

¹⁷ NATO (2022), p. 98.

¹⁸ The Department of the Air Force (2021), The Department of the Airforce Role in Joint All-Domain Operations, AFDP 3-99 / SDP 3-99, p. 4. Joint All-Domain Operations (JADO): Comprised of air, land, maritime, cyberspace, and space domains, plus the EMS. Actions by the joint force in multiple domains integrated in planning and synchronized in execution, at speed and scale needed to gain advantage and accomplish the mission.

¹⁹ Ibid, p. 15.

²⁰ Ibid, p. 15.

²¹ Multinational Capability Development Campaign (2022), Annex A,

p. A-32. ²² Ibid, p. 16.

²³ Department of the Army Headquarters (2021), Army Multi-Domain Transformation - Ready to Win in Competition and Conflict, Chief of Staff Paper #1 (Unclassified Version), Department of the Army, p. 2.



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capabilities within the resource allocation. The operational level headquarters can support tactical level joint operations by coordinating the use of joint effect capabilities.

According to the UK MDI concept, the differences in the geostrategic position of adversaries must be considered in the multidomain approach. In Russian art of war, the role of land forces is emphasised, and the Russian armed forces have traditionally been strong in the land domain. In state of competition and armed conflict with Russia, the requirements for multi-domain operations are influenced by the large and massive land forces and NATO's long border with Russia.²⁴ This idea is similar to the Polish perspective, where operational planning is guided by land force-centric thinking. In all other domains, operations are conducted in support of land forces.²⁵

The lower tactical level (corps level, etc.) has means to command the execution of multi-domain operations, emphasising the ability to create cross-domain synergy. The principles of tactical level implementation are cross-domain command, cross-domain synergy, dynamic operations, and coordination of (domain) effects. The corps may have an independent multi-domain-unit based on the US model, with the ability to use the capabilities of all domains (*Multi-Domain Task Force, MDTF*). Alternatively, the corps may have the capabilities of all domains either organically or allocated from higher command levels.

According to the U.S. MDO concept, existing division and corps level command echelons are tasked with fighting and defeating specific components of the adversary's system. At the division and corps level, operations are conducted with the forces assigned and other capabilities allocated to the commanding echelon.²⁶ It could be concluded that the capability to execute dynamic multi-domain or cross-domain actions will be at this level of command.

At the lower tactical level, the dynamic readiness and implementation of tactical level joint operations are led and synchronised to enable cross-domain synergy. The use of the MDTF/MDE unit operating in the area is led and synchronised. The use of the forces and capabilities assigned to the command is planned and led to fulfil the domain-specific task. The shared situational awareness of the operational environment is utilised and the situational picture is supplemented with the situation of one's own domain.

At the unit level, multi-domain operations consist multi-domain capabilities, the readiness of all domains (situational awareness, force protection, effects), decentralised operations, and personnel expertise. At the unit level, the threats posed by the multi-dimensional engagement space are considered and the opportunities in the unit's battle are utilised. Dynamic operations are enabled by a shared situational picture and C2 system as well as mission command.

At the unit level, multi-domain operations require personnel expertise to operate according to standard operating procedures in the multi-dimensional engagement space, especially considering the electromagnetic spectrum. Personnel must be able to operate both the unit's own systems and the systems provided for use. At the unit level, multi-domain or cross-domain synergy can be formed with systems integrated into the unit's organisation or, for example,

²⁵ Tähtinen Janne (2022), Multi-Domainista mosaiikkiin – ajatelmia yhteisoperoinnin näkökulmasta, Finnish National Defence University, Department of Warfare, Helsinki. by building a separate multi-domain effects battalion or battle group with the capabilities of all, especially non-kinetic domains.

The US Army's MDTF includes long-range weapon systems from rockets to hypersonic weapons and non-kinetic capabilities in a completely new multi-domain formation. The main focus is on long-range firepower, but it has been understood in development that this is not the only enabler of joint operations in all situations. The use of long-range capabilities for land and sea requires the use of space capabilities to enable the sensor-to-shooter chain.²⁷

The core of the MDTF unit is a battalion (Multi-Domain Effects Battalion, MDEB) intended for long-range reconnaissance and non-kinetic influence, which supports, among other things, long-range fires with reconnaissance and simultaneous non-kinetic effects. MDEB personnel also serve as joint operation experts in multi-domain operations.²⁸

At the lower tactical level, it is necessary to continue operating according to the basic principles of combat – fire, movement, and protection – but supported by new capabilities. This enables multi-domain operations on a smaller scale, utilising advanced sensors and weapons systems. Key elements include electronic warfare, drones, loitering weapon systems, and space capabilities, which enable effective engagement of the enemy in different domains while maintaining tactical flexibility.²⁹

Concluding Remarks – **Towards Multi-Domain-**Thinking

The multinational MCDC research project has defined multi-domain operations as an activity where two or more domains interact with each other (cross-domain synergy). Although the definition requires more than one domain, multi-domain operations do not necessitate continuous interaction between all domains.

This is crucial to understand. Although multi-domain operations enable cooperation, integration, and leadership among all domains and different actors, the situation dictates the operational requirements. If a military challenge can be more effectively resolved by directly using a single domain, then that should be the approach taken.

Multi-domain operations are based on a comprehensive planning process (Comprehensive Operations Planning Directive, COPD), in which the operational environment is viewed as a complex system. Military objectives are achieved by altering prevailing conditions toward a desired state (Decisive Conditions, DC). Tasks assigned to forces generate actions, which in turn produce effects. In planning multi-domain operations, the combined potential of different domain activities to generate effects across all dimensions of the engagement space (physical, virtual, and cognitive) should be considered more comprehensively. More effective sensors, weapons and command systems, combined with an evolving mindset, provide an advantage over adversaries in all threat scenarios.

Multi-domain operations place significant demands on personnel competence. MDO require continuous training and exercises to develop professionals in each domain who understand joint operations, as well as joint operations professionals who understand the integration of different domains.³⁰

²⁸ Ibid.

²⁴ Tähtinen (2024), p. 88. See also Development, Concepts and Doctrine Centre (2020), *Multi-Domain Integration*, Joint Concept Note 1/20, Ministry of Defence, p. 6,

 $https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/950789/20201112-JCN_1_20_MDI.PDF.$

²⁶ Feickert (2021), passim.

²⁷ Mroszczyk (2024), p. 96.

²⁹ Lindfors Jonny, Scheynius Jan and Lundberg Jan (2024), Preparing for the next war: An analysis of the Swedish army's needs for transformation, Analysis, Kungl Krigsvetenskapsakademien,

https://kkrva.se/en/preparing-for-the-next-war-an-analysis-of-the-

swedish-armys-needs-for-transformation/.

³⁰ Mroszczyk (2024), p. 102.



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Multi-domain operations have a significant impact on education, as synergy and convergence require deep knowledge of how different domains interact and how actions are coordinated between them to achieve desired effects. Personnel must be trained to think and operate in a multi-domain environment. Training programs for officers and senior leaders must emphasise tactical thinking and decision-making in a *combined joint multi-domain* context. MDO also requires a shift from domain-specific exercises to joint multi-domain exercises that focus on coordination and effects between domains.³¹

MDO concepts have sparked widespread interest, enthusiasm, criticism, and even resistance. Real capability is not built solely on new ideas; turning them into operational capability requires years of equipping, training, and exercises. Practical implementation is limited by factors such as multinational conceptual discrepancies, branch competition, immature technologies, and tensions between civilian and military leadership.³²

Multi-domain concepts provide the foundation and direction for building capabilities. They also represent a logical depiction of the evolution of warfare, the need to respond to changes in the threat environment, and the opportunities offered by technological development.

Additional Information

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³¹ Lindfors et al. (2024).

³² Ellison Davis & Sweijs Tim, (2024), *Empty Promises? A Year Inside the World of Multi-Domain Operations*, War on the rocks,