



INNOVATION HUB



Leveraging Innovation for the Alliance

Innovation Branch Book

2022

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Introduction

Since its inception, NATO's military power has relied on intellectual and technological superiority. The pace of change of our adversaries and our operating environments, not least in the technological area, challenges the Alliance's ability to stay in front of its adversaries and to maintain maximum freedom of manoeuvre.

NATO will be able to maintain its edge through a new data-centric, modular and agile approach to capability development, in order to enable Multi-Domain Operations (MDO). MDO coordinates and synchronizes activities from multiple forces (military and non-military). MDO is the future of NATO operations.

Digital Transformation will enable the Alliance to conduct MDO, ensuring interoperability across all domains, enhancing situational awareness and facilitating political consultation and data-driven decision-making. It will provide a digital-ready workforce, agile digitally-enabled processes, and advanced technological solutions by 2030.

Innovation is a key driver for Digital Transformation, providing tools, techniques and the right mindset to constantly experiment and innovate. The ACT Innovation Branch has been leveraging Innovation since 2012 and is a key stakeholder to support NATO through this transformational process.



What is Innovation for ACT?

Innovation is the implementation of new and/or different ideas, methods or solutions that achieves value for the Alliance. Innovation is both a process and an outcome. It complements, not replaces, more traditional approaches.



ACT Innovation Branch mission

We leverage and implement innovation as a key driver for digital transformation

We provide experimental solutions to the NATO warfighter, better and faster

We inform and help de-risk capability requirement formulation

We inform the Strategic Level on the implications of technological innovation

We foster adoption of innovation within the Alliance

Our Approach

Bringing ideas to life to create value for NATO on a larger scale through:

Open innovation processes and mindsets

We apply Open Innovation to address warfighter pain points and push Innovation opportunities

Using an agile methodology to deliver faster and better

We develop in an agile manner through discovering, designing, developing and delivering experimental minimum viable products.

A large network of experts

We facilitate and grow the NATO Innovation Network of entities sharing the values and principles of open innovation.

Innovation Functions a Glance

The ACT Innovation Branch is engaged in two types of innovation that are complementary and fuel one another:

- **Open Innovation:** Open Innovation, in a defence context, is the practice of "pulling" innovation coming from the civilian world for the benefit of military applications and to leverage them at the speed of relevance. This requires sharing knowledge and information about problems and looking to experts outside the defence sector for solutions and suggestions.
- **Directed Innovation:** Directed Innovation, in a defence context, is the practice of "pushing" the development of military technologies via the Strategic Commands' Scientific Programmes of Work. This is the traditional approach to military innovation.



Our Assets: Nato Innovation Hub

Enabling NATO's digital transformation through open innovation and agile development



INNOVATION HUB

The NATO Innovation Hub, an ACT Innovation Branch toolbox, has been developing and spreading Open Innovation best practices and tools within the Alliance since 2012. The Innovation Hub mission is to help NATO adapt and respond to emerging challenges by delivering recommendations and experimental solutions that provide value to users and prefiguring potential military capabilities.

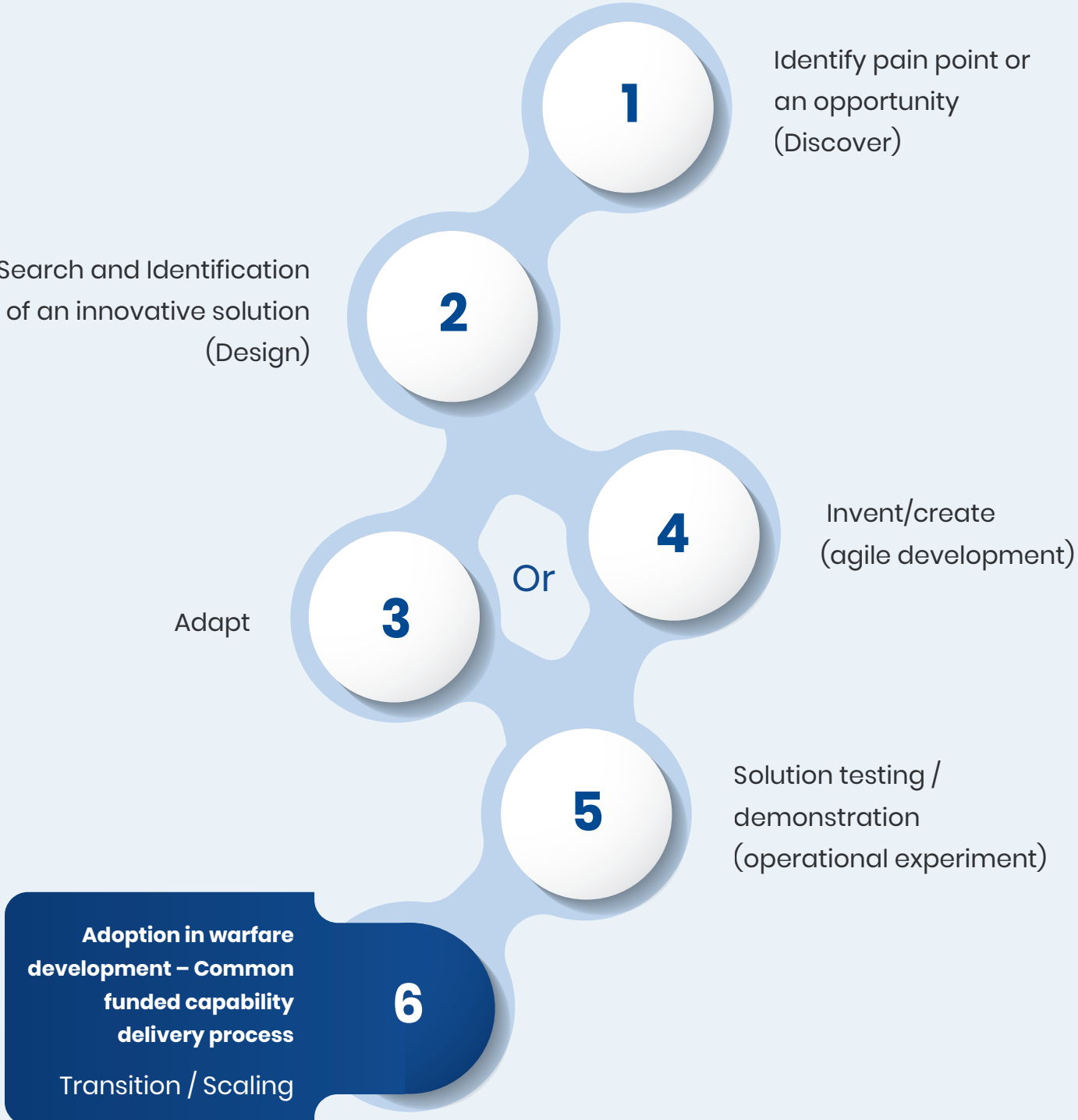
In 2020, the Hub added a "Lab" capability able to bring solutions to life by developing iteratively experimental products (e.g., concepts, demonstrators, and Minimum Viable Products (MVPs)). Hub projects implement agile approaches at the early stages of capability development, help inform about the art-of-the-possible and de-risk requirement formulation.

The Innovation Hub is also facilitating the adoption of Innovation within the Alliance and the development of synergies by facilitating collaboration through the NATO Innovation Network, a federation of Open Innovation entities (from NATO and Nations), providing mutual support, sharing best practices, issues to solve, subject matter expertise, audiences and solution proposals.

Open Innovation can provide a number of benefits to the ACT warfare development agenda. Benefits to the warfighter include particularly:

- Accelerated delivery by applying faster engagements and rapidly building communities of interest.
- Building, online brainstorming and solution/ product development by applying agile approaches.
- Improved user/ operator feedback, satisfaction and adoption by putting the user/ operator in the centre of innovation.
- Reduced cost and risk by informing the requirement and favouring the adoption and adaptation of existing solutions rather than developing unique proprietary solutions.

The Innovation process: How do we solve problems and bring ideas to life?



10 Years of Innovation at ACT



Using innovation as a tool to help NATO transform and adapt, ACT Innovation has been at the source of many successful outcomes throughout NATO since 2012 such as:

- **The NATO Innovation Network**, currently with 18 new Open Innovation entities in 10 Nations and the NATO Enterprise.
- **The initiator of the Information Environment Assessment Capability program**, crowd-initiated and experimented during the exercise Trident Juncture 2018 and now being developed for NATO StratCom.
- **The pioneer in exploring and defining** Cognitive warfare / cognitive superiority that led to concept development and became a major component of the Warfare Development Agenda (WDA).
- **The first concrete uses of AI and machine learning** based tools in the NATO Enterprise through MVPs.
- **The conceptualization of a defense accelerator for NATO** (later named DIANA) and a NATO Innovation fund and now led by NATO HQ.
- **NATO Digital Transformation**, with a vision recently approved by the Nations, that significantly originates from the first successful agile developments within the NATO enterprise, in 2019–2020, by the ACT Innovation Hub, NCIA and ACO.

2022 Highlights: Learn about our key achievements this year

Based upon requests from the NATO Command Structure and the Nations, priorities and opportunities, the Innovation Branch leverages innovation through its various assets (communities of experts, knowledge and solutions) to solve problems and provide better understanding to the benefit of NATO. The types of products are many and span from:



A better understanding of a stated problem.



The analysis through horizon scanning of the current and prospective state-of-the-art in a given area.



The design of a new concept.



Demonstrators and MVPs, notably (but not exclusively) software-based.



Building communities of interest and connecting NATO with non traditional actors.



Academic Alliance

Launched in 2022, the Academic Alliance is an initiative founded and spearheaded by the ACT Innovation Branch and the Strategic Issues and Engagements Branch.

The Academic Alliance is a network of military academic partners from NATO member and partner nations. The goals of the Academic Alliance are to:

1

Bring open innovation training to cadets and students at an early stage.

2

Connect cadets and students to their counterparts across the Alliance.

3

Improve the results of the NATO Innovation Challenge, Disruptive Technology Experiments, Hackathons, and other open innovation efforts/events organized by NATO and its partners by bringing more young minds together from across the world.



To initiate the Academic Alliance, the NATO Innovation Hub organized Disruptive Technology Experiments (DTEX) using wargaming principles to evaluate new ideas and technologies in an operational context. Pilot experiments were held with several military academies. DTEX events at military academies are designed to help cadets improve their problem solving and decision making skills, hence contributing to preparing them to future warfare.



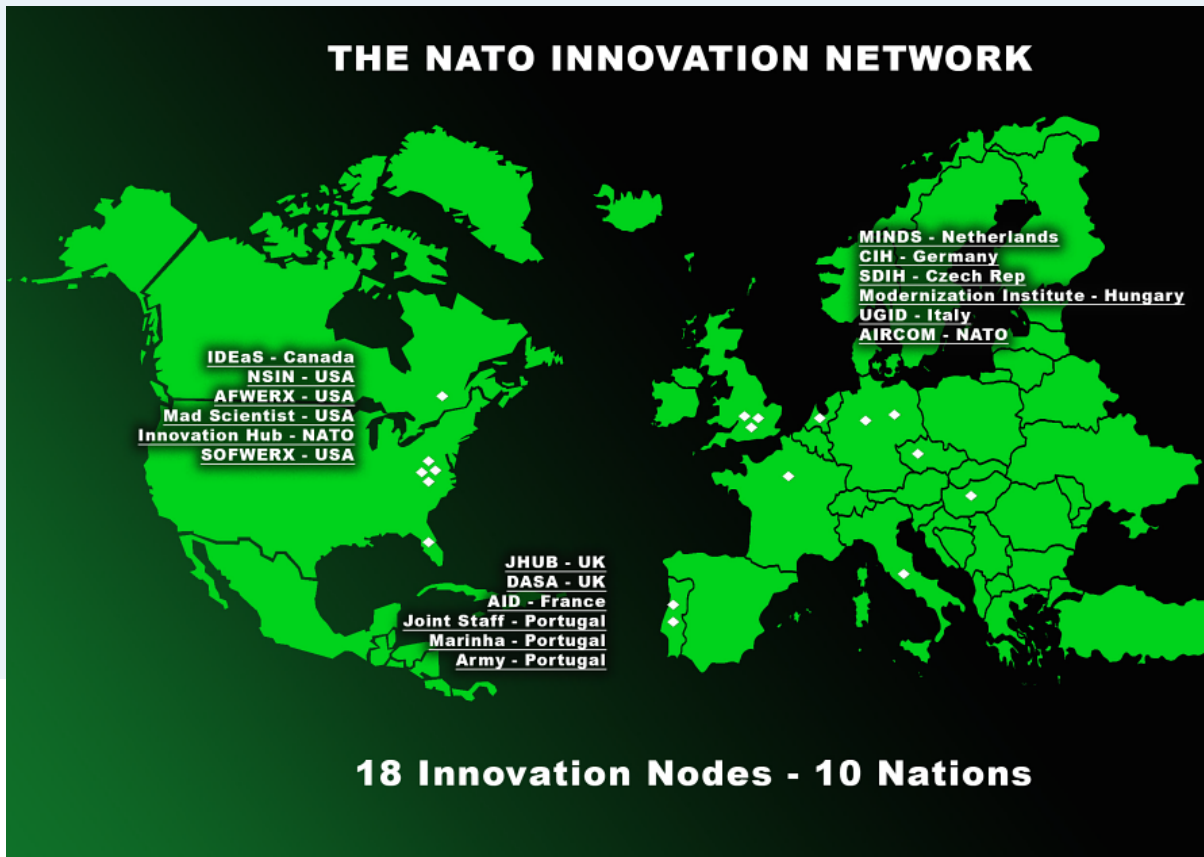
Wargaming Initiative for NATO

The increasing need for operational simulations throughout the NATO Command Structure, such as "Wargaming", in support of operational planning, capability development and training, brought SACT and NATO Nations to approach the requirement from the Open Innovation angle.

The Innovation Hub was asked to build a community of passionate wargamers in support of a cultural change from the bottom-up. This community was kick-started at the first-ever Wargaming Initiative for NATO (WIN) in October 2022, where military from across the Alliance came to practice wargaming and discuss their passion and needs with experts.

A key partnership underpinning this initiative was sealed between the NATO Innovation Hub and the Fight Club international (FC), an open online community of military wargaming. Through FC, military are participating in realistic simulations where they can experiment new tactics, strategies, courses of actions and technologies. The results of their experiments are captured and analysed to benefit NATO.

This new initiative intends to support and benefit all those who intend to leverage wargaming in NATO. While directly informing and supporting the "Cognitive Superiority - Audacious Wargaming" Line of Delivery, the WIN community is planned to support SHAPE in 2023.



NATO Innovation Network expansion

Acknowledging that it takes a robust network of like-minded entities to help transform the Alliance, SACT mandated the Innovation Hub to create the NATO Innovation Network (NIN) in 2017. The NIN gathers governmental open innovation entities that share the same goals and principles of sharing best practice and spreading innovation through collaboration. Its end goal is to spread the innovation mindset, techniques and processes all over the Alliance. In 2022, the NIN supported innovation in North Macedonia and Romania. Two new members also joined: The Portuguese Army Innovation Cell, and the NATO Air Command Innovation Cell.

Collaboration with the NATO Science and Technology Organisation (STO)



The relationship between ACT and the STO is defined in the STO-ACT Structured Partnership document signed by the Science and Technology Board Chair and SACT. As part of the collaboration between the two organisations, and in addition to more than 50 ACT-STO cross activities and projects, the Innovation Branch supported a Science and Technology track at the 2022 Spring TIDE Sprint conference for the first time. 10 topics of high interest were explored including quantum technologies, hypersonics and space.

Extending ACT's knowledge on new and emerging technologies, through STO experts, is essential to both identifying threats and creating innovation opportunities. The very diverse attendee pool at TIDE Sprints ensures the information presented is shared with and benefits personnel across the Alliance.

Collaboration with the NATO Communications and Information Agency (NCIA)



The Innovation Branch commissioned 6 separate activities with NCIA in 2022. The topics covered ideas such as ISR asset management, enterprise secure messaging and hypersonics. The report from the “Hypersonic Impacts on C2” is being exploited by the NATO Integrated Air and Missile Defense (IAMD) team and will support future decisions on improved C2 systems. It may well have an impact on future C2 doctrine and tactics, techniques and procedures.



Collaboration with Academia and Industry

The Innovation Branch Office for Collaboration with Academia and Industry's (OCAI) core mission is to facilitate and develop ACT "not-for-profit" collaboration with Industry and Academia in support of all ACT work strands. 2022 OCAI efforts have resulted in keeping a very high and fruitful level of collaboration with the NATO Industrial Advisory Group (NIAG), especially thanks to the successful ACT-NIAG visit in Norfolk in early 2022. OCAI supported the development of ACT cross-body knowledge and the use of existing channels with Industry and Academia (e.g. NIAG, TIDE interoperability Community, Innovation Hub network, Academic Outreach).

Understanding and solving problems through experimentation and testing.

Maritime Science and Technology Program of Work

The Maritime Science and Technology POW 2022 executed by the Centre for Maritime Research and Experimentation (CMRE) brought substantial progress to its different areas to keep the technological edge for the Alliance. It deals with several Emerging Disruptive Technologies (EDTs). For Anti-Submarine Warfare (EDTs), the main outcomes are on the passive ASW barrier with data sharing between autonomous assets to better detect and track a threat, including bottom nodes with very innovative sensors such as quantum magnetic sensors, for instance.

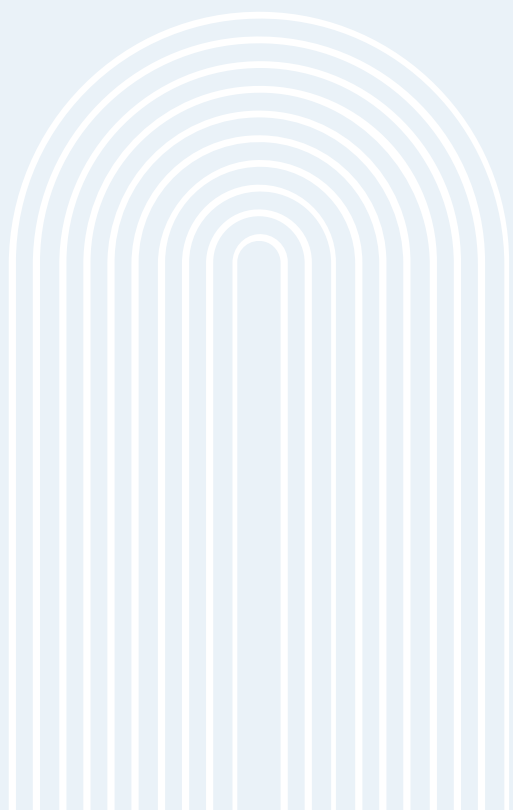
For Mine Counter Measures, a direct collaborative tasking between two underwater unmanned vehicles at sea was achieved to manage the two phases of detection/identification and classification, enhancing time and efficiency of the mission. For data and environmental assessment, valuable data from the High North were gathered and analysed to enhance our knowledge and model of this area of interest, taking into account climate change. Studies on underwater infrastructure protection were completed. Finally, fruitful trials and exchanges on interoperability were accomplished during NATO Exercises, such as Dynamic Messenger'22.

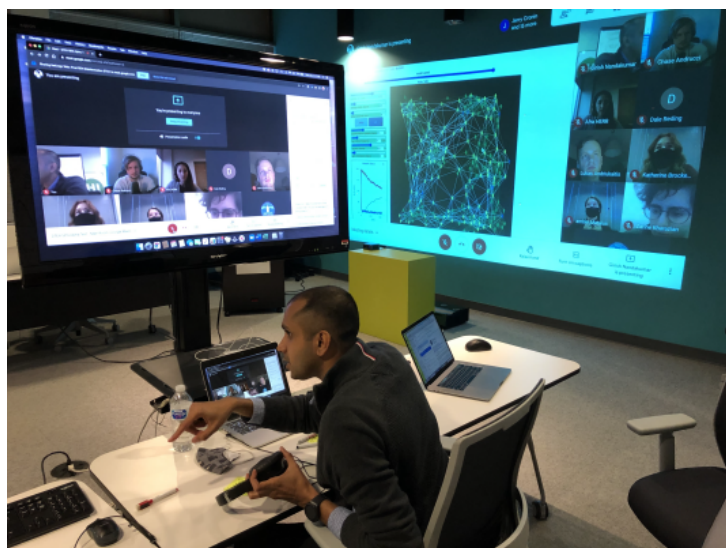




Critical thinking course

As part of its Cognitive Project, the NATO Innovation Hub has been exploring solutions to feed the ACT Cognitive Superiority line of effort. With the help and knowledge of renowned experts, the critical thinking pilot course was initiated in 2022 to boost NATO staff's critical thinking skills. Critical Thinking is the ability to develop objective understanding of a situation. It is a process that has provided many benefits in the areas of problem-solving, decision-making, creativity and many other aspects. The course has attracted a significant number of participants from NATO and will conduct another iteration in 2023 due to the high demand.





Disruptive Technology Experiment - DTEX

The NATO Innovation Hub conducted several Disruptive Technology Experiments (DTEX) in 2022 in partnership with the CMRE, the Massachusetts Institute of Technology (MIT) and several renowned academic partners. The DTEX mixes open innovation techniques and computer simulations to evaluate new

ideas and technologies in an operational context and brings new perspectives by involving Academia into the process.

In 2022, DTEX contributed to complete the "Trust in Autonomous Systems" study in support of MARCOM, then supported the digitization of the Dynamic Messenger Exercise, also with MARCOM. After supporting the first Wargaming Initiative for NATO in October 2022, DTEX has become the entry point for many organization wishing to kick-start wargaming locally and online. DTEX is also a significant catalyst for bringing Military Academies together for wargaming within the Academic Alliance.



Innovation challenges



Two NATO Innovation Challenges took place in 2022 in North Macedonia and Romania, respectively on Bio-response in support of the NATO Medical Community and on Data Management and Security in support of ACT and NCIA. Both Innovation Challenges attracted hundreds of solutions and created new business and cooperation opportunities. Innovation Challenges allow NATO to attract and showcase innovative solutions through an open and flexible format.

The Challenges take place twice each year on a different topic in cooperation with a Host Nation based on identified and meaningful problems. The Innovation Challenge is also seen as a first step to extend the NATO Innovation Network and to foster open innovation within the Host Nation's defense ecosystem.

Dynamic Messenger

The Innovation Branch actively participated in Dynamic Messenger in September 2022. This was the first operational experimentation exercise that focused on maritime unmanned systems. Several MVPs were demonstrated and tested during the exercise to align with end-users' needs in an operational environment.



5G experiment testing

ACT executed a discovery experiment in coordination with the Latvian Army to test 5G communications. A second event during the experiment was a demonstration of a virtual Joint Operations Centre (JOC) within virtual reality. Operational personnel interacted in virtual space and did not need to be collocated to be effective. The application of this virtual JOC can increase resilience and survivability of NATO command and control functions.

Solutions

Providing minimal viable products (MVP) using agile methodology to fill the gap and boost NATO Defence capabilities.



Air Operations – KRADOS

KRADOS is a suite of interdependent micro service applications developed by the US Air Force that are used to create an Airspace Coordination Order (ACO) and an Air Tasking Order (ATO). In the context of the Russian invasion of Ukraine, the Innovation Branch team, supported by the ACT Office of Security, was able to rapidly field KRADOS for experimentation by NATO AIRCOM. The key benefit of the experimentation was to prove the efficacy of modular applications in the NATO environment. Furthermore, as an added benefit, the Innovation Branch built a translator module for KRADOS. The translator module was tested during CWIX, NATO's interoperability exercise, and was able to interact with AIRCOM legacy systems.

Solutions

Air Operations – JEDI



HQ SACT successfully handed over the Joint Terminal Attack Controller (JTAC) Enterprise Data Infrastructure (JEDI) MVP to NATO AIRCOM in October 2022. This new centralized digital system replaces complex and time-consuming procedures, enabling effective tracking and sharing JTAC qualifications within NATO and Nations.

Solutions

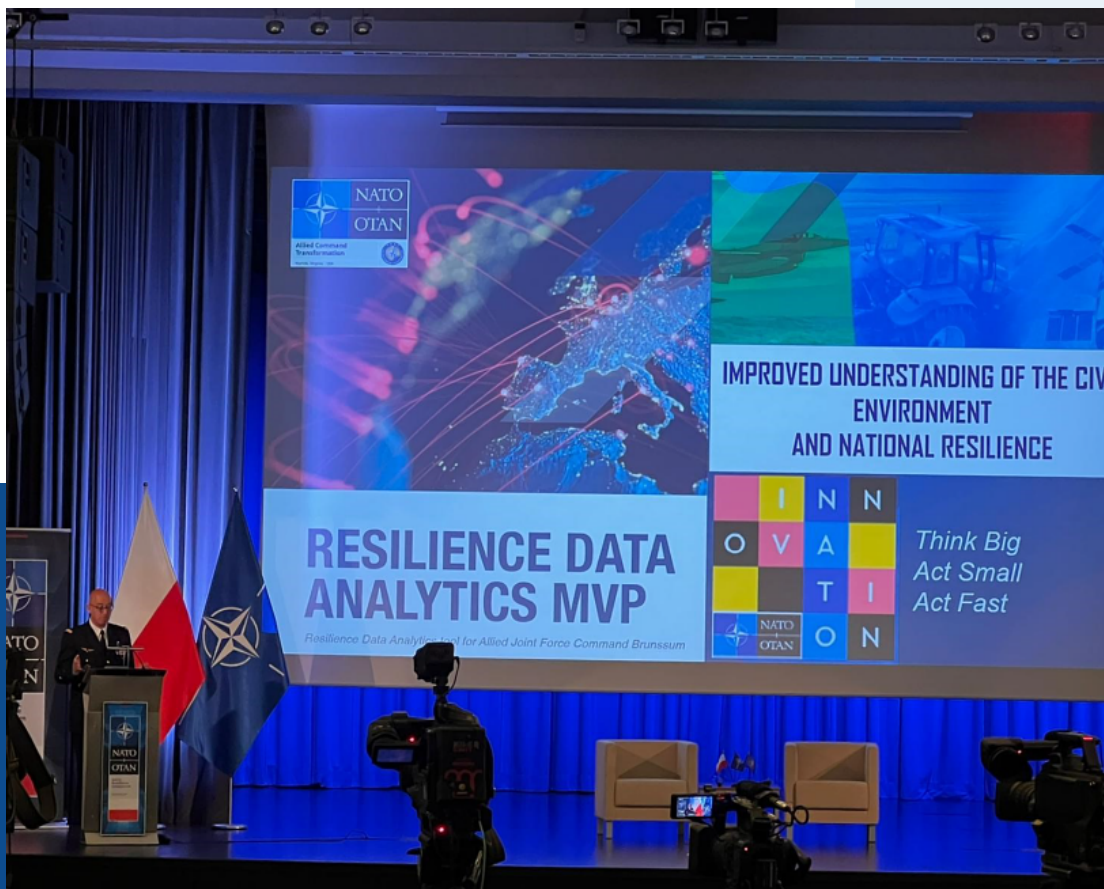
Maritime Operations LIME 711



The MVP LIME 711, an experimental tool to enhance data sharing and exploitation in Naval Mine Counter Measure operations, was successfully tested during the NATO Exercise DYNAMIC MESSENGER 2022 by the Standing NATO Mine Counter Measure Group 1 (SNMCMG1) and by national teams equipped with Autonomous Underwater Vehicles (AUVs). The test was executed within a structured Operational Experimentation aiming at the enhancement of the future NATO Maritime Situational Awareness capability.

Based on the successes achieved in 2021 (i.e., testing during a Table Top Exercise) and in 2022 (i.e., testing during the LIVEX DYMS 22), the MVP has been offered to Nations and the NATO enterprise for further development and/or exploitation at the beginning of 2023.

Solutions



Resilience – Resilience data analytics MVP

ACT Innovation, in cooperation with ACT and NCIA Data scientist teams, developed a data-science based tool, to improve civil environment and resilience awareness related to the seven baseline requirements of resilience for NATO JFC Brunssum. In 2022, the “Resilience data analytics MVP” has continued its development phase. New data from Portugal, Slovakia, Romania and Hungary were injected into the tool to benefit NATO Nations. The Resilience Data Analytics tool has demonstrated the potential of harnessing open source data from many perspectives coupled with Big Data analytics, machine learning and data visualization to indicate levels of resilience in specific domains.

Solutions



DATA - CASA

JFC Naples approved the CASA MVP (Collect, Analyse and Share Application), after initial User Acceptance Testing. The MVP will be placed on an experimental non-classified network to finalize the testing phases. It will replace the current time consuming email-based method of data collection, importation and manual report production.

Solutions



Intelligence – NOCMB

The NATO Operational Collection Management Bridge (NOCMB) MVP, a data-driven intelligence tool, has successfully completed its User Acceptance Testing phase in 2022. With the delivery of the NOCMB MVP, the NATO intelligence community, SHAPE and the Joint Force Commands, in particular, will have a more dynamic and collaborative collection management process supported by an intuitive and user-friendly platform. The MVP will also inform the requirements for a future fully developed solution through the Common Funded Capability Development process.

Solutions



Medical - Medsuite

The ACT MED Branch continued explorations on the Patient Tracking MVP which was added to the NATO Communications and Information (NCI) Agency, Approved Fielded Product List (AFPL) in 2021. This MVP has been provided to seven nations (BEL, DEU, FRA, USA, NLD, HUN and GBR) as of December 2022 and is undergoing trials for digitalisation of patient tracking.

Additionally, the NATO Centre of Excellence for Military Medicine (MilMed CoE) is planning integration of the MVP into experimentation, training and exercise events in future years' plans. In 2022, the MVP was enhanced to provide output to the NATO Common Operational Picture (NCOP), informing the operational commander's ability to better 'know, see, and understand' the operational environment. Capability requirements identified through development of the MVP continue to de-risk the future Medical Suite (MEDSUITE) of capabilities incorporated as part of the Enablement Support Services (ESS).

In October 2022, building on the initial success of the Patient Tracking MVP, the ACT Medical Branch in cooperation with the ACT Innovation Branch began explorations into development of a fuller Medical Management Prototype. Closely working with the ACO Joint Medical (JMED) Branch, ACT Medical Branch established an Operational User Group of medical operations subject matter experts (SME). This SME group has started to evaluate and develop MVP requirements addressing the top priorities for digitisation of known medical planning and management functions: Patient Tracking, Patient Regulating, Medical Reporting and Recognised Medical Picture, and Medical Capabilities Directory. These MVPs will be operationally tested during several Exercises in 2023.

Solutions

Digital Transformation - Lake Diver



In 2022, the ACT Federated Interoperability and Innovation Branches, in cooperation with NCIA, have developed a tool that allows information stakeholders to discover, search, and validate data exchanged between the NATO Enterprise, Allies, and Partners through the NATO Core Data Framework (NCDF) Data Lake. A challenge of the current operational environment is the presence of large volumes of data created in different Communities of Interest (COIs) in different formats and using different technologies. These “stovepipes” of data are not easily shareable within the NATO Enterprise.

The main aim of the Lake Diver 2 project are to enhance the features of the former version but also to bring a wealth of benefits to a broad operational community. Users will get access to a broader set of data objects (also known as Battlespace Objects or BSOs) than they currently have including some from open sources which may be automatically ingested. This is contributing concretely towards Data-Centricity as part of Digital Transformation.

Solutions

Cyber - Cyberspace Situational Awareness System (CySAS)



CySAS was successfully developed in 2022 to inform the NATO Cyberspace Operational Requirement Statement for the first operational Cyber Awareness tool to be used by the Cyberspace Operation Centre (CyOC). The success of CySAS led to a SHAPE request for continuation of the development under the new name Cyberspace Situational Awareness Tool (CySAT). This new MVP will connect the NATO Strategic Commands, NATO organizations and industry experts in this rapidly advancing field. The goal of CySAT is to be a beneficial and effective tool for the whole NATO Cyber community.

Solutions



Communication – NI²CE Messenger

This project is executed in close cooperation with NCIA. The goal of the project is to test possible post-quantum encryption solutions, improve the JChat interoperability and field a proven technology for instant communications to desk and non-desk workers in the Alliance. NI²CE Messenger provides end-to-end encrypted instant communication (with all features that can be found in other well-known applications) to personal smartphones and other devices so we can communicate more securely without any data leakage and in a more resilient fashion.

Solutions

Lessons Learned - OCAT



The OCAT MVP, a collective lessons-learned (LL) collection tool developed for the benefit of NATO JALLC, was launched in August 2022 and subsequently tested during the exercise DYNAMIC MESSENGER 2022. Further testing of OCAT will feed the requirements for the future NATO LL Toolset, improving NATO's LL capability.

Solutions



3D – Allied 3D Vault

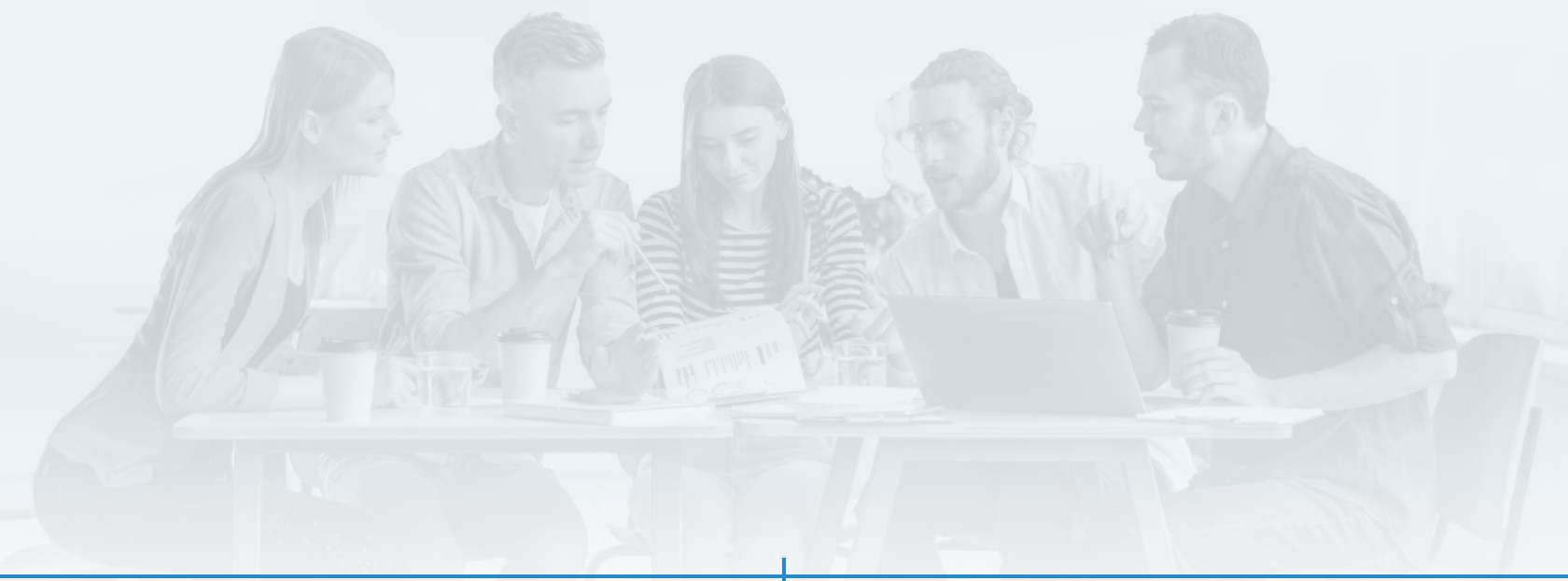
The ACT Innovation Hub initiated the development of a new MVP in August - Allied 3D Vault (A3DV) supports specialists in NATO, Nations and Allies in optimizing their method of work. The A3DV provides designers with tools and creates a collaborative environment by building a cooperative community, willing to exchange data and create common projects, enabling efficient and user friendly search and share functionalities, offering comfortable communication channels and helping to manage data and information, including descriptive data file formats. Currently, NATO and NATO Allies do not have a shared repository, resulting in unnecessary expenses, inefficiency and sometimes even missed opportunities of using technologies. Sharing 3D files and reusing them throughout NATO projects and activities would facilitate a reduction in cost / time, and ensure safe collaboration and use.

Our Team

Our staff serves as key facilitators and enablers – ensuring the broader community works together collaboratively and generates innovative solutions that benefit NATO. This is a diverse team of approximately 50 persons, composed of permanent NATO personnel; military and civilian staff from across the Alliance; skilled industry contractors; and academic interns.

While the main workforce is based in Norfolk, Virginia, not all staff are physically on-site. In fact, many work remotely from across the Alliance. Their duties are equally diverse. Some tackle experimentation and solution development as members of a project team, others support IH operations from an implementation standpoint, ensuring the project teams and wider innovation community have the tools and environment they need to flourish.

Our staff also focuses on the development and growth of the innovation community and to delivering the maximum positive impact for NATO and its members.





Interested to learn more,
contact us!



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