



NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITÉ DE L'ATLANTIQUE NORD

**NATO Modelling and Simulation
Group (NMSG)**



NMSG Overview and Response to New Security Challenges

SISO SIW, February 2024, Orlando

Bharat Patel, NMSG Chair and Dstl (UK MoD) Fellow

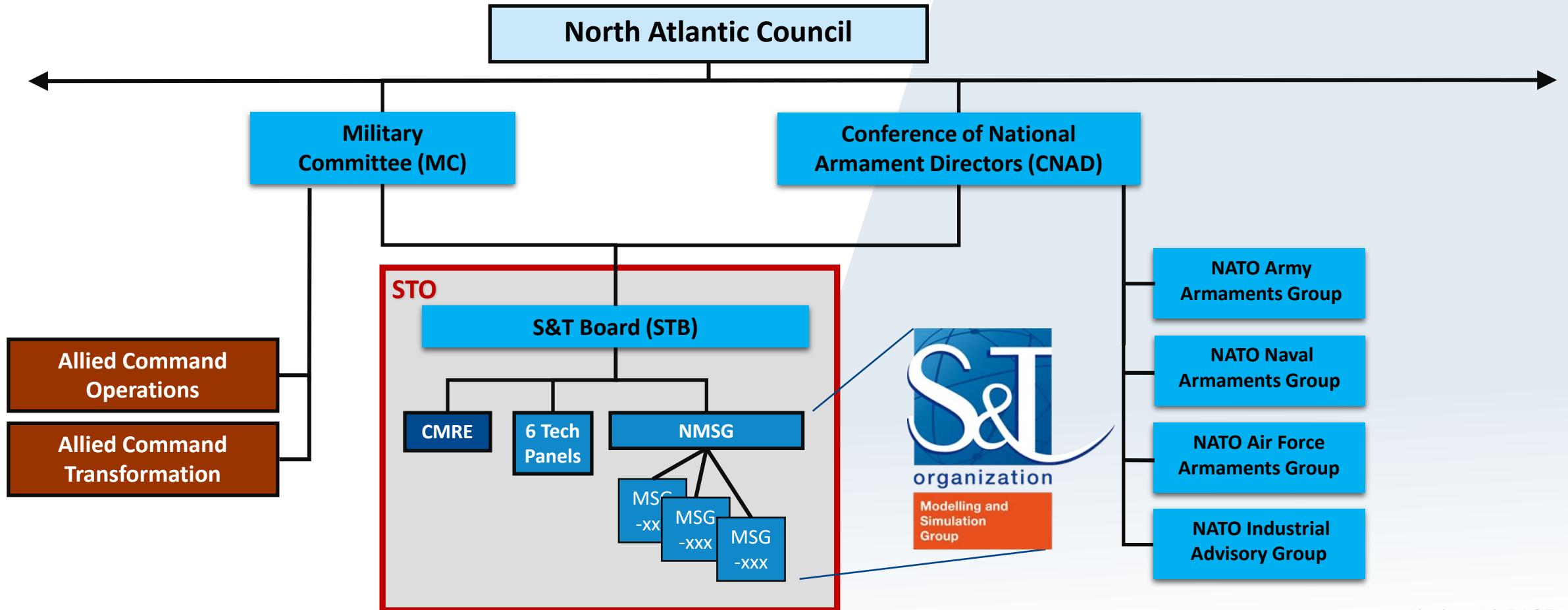
VERSION 26 Feb 2024

<http://www.sto.nato.int>
<http://nmsg.sto.nato.int>

NMSG Chair: Mr. Bharat Patel
NMSG Vice-Chair: Col (ret.) John FERRELL
MSCO Head: Cdr Alvaro HERRAIZ SOLLA



NMSG addresses S&T and Capability topics



Modernising Defence and Security M&S

- Future Operational Environment
 - Threats are continuously evolving
 - Rapid technology change
 - “congested, cluttered, contested, connected and constrained”
 - Resurgent Russia, N Korea, Islamic state...
- New Operating Concepts and Responses
 - Renewing and sustaining our M&S capability
 - Many models, simulations and data are outdated or developed for one purpose
 - Need to adapt new methods to meet the dynamic nature of operational needs
 - Multi-Domain Operations – Land, Air, Maritime, Cyber and Space



NMSG Mission and Activities

Exploit M&S to its full potential across NATO and the Nations to enhance both operational and cost effectiveness.



NAC approved, currently under revision

NATO M&S Master Plan
(8+ years)

NMSG Mission-Oriented Research
(5-8 years)

NMSG Activities and Task Groups
(1-3 years)

Establish a Common Technical Framework

Provide Coordination and Common Services

Develop Models and Simulations

Employ Simulations

Incorporate Technological Advances

Applied S&T and Support to Capability Development

Distributed Synthetic Training

Operational Mission/Decision Support

Federated Battle Labs to support CD&E

Objectives and Deliverables:

- CONOPS, Policies
- Interoperability Standards
- STANAGs

Fundamental S&T and Technology Watch

Research Task Groups

Specialist Teams

Research Symposia

...

M&S Standardization

Standards Development

Test, V&V

Education, Promotion

...

Outreach, Education, and Communication

Lecture Series

Technical Courses

Website, Social Media

...

- Maintain S&T advantage
- Provide S&T advice

- Inform and support our stakeholders
- Deliver professional education



Supporting all M&S Domains

Training and Education

Mission Rehearsal

Support to Operations

Capability Development

Acquisition and Procurement

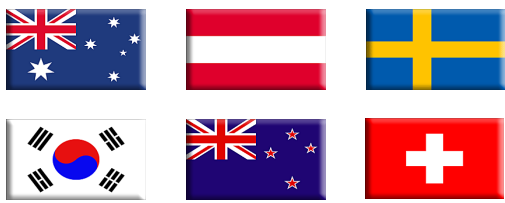
Connecting M&S users across the Alliance

24
Member Nations



80+
National Representatives and Members

6
Partner Nations



14
Associate Members



~30
Task groups at any time

- M&S of Effects of Cyber Attacks
- AI augmented immersive simulation
- NATO Interoperability Certification
- M&S as a Service (MSaaS)
- Urban Combat Advanced Tactical Training
- M&S support for Crisis and Disaster Mgmt
- NATO Standards for Federated Simulation
- Mission Training through Distributed Simulation
- M&S for Acquisition
- Data Farming Services
- Physics-Based EO/Infrared Simulations
- Space Weather Environmental Modeling
- C2-to-Simulation Interoperability
- ...

500+
Task group members and SMEs

NMSG Products

- Scientific Reports, Conferences, Whitepapers
- Standards and Guidance Documents
 - Allied M&S Publications (AMSP)
 - Standardization Recommendations (STANRECs)
 - Standardization Agreements (STANAGs)
- Prototype tools and capability demonstrations
- M&S Educational Material
- M&S Interoperability Certification

AMSP-01 NATO M&S Standards Profile, AMSP-04 NATO Education and Training Network, STANAG 4603 HLA, Missionland Dataset, SISO-STD-016-00-2016: Standard for UCATT Laser Engagement Interface, SISO C2Sim, MSaaS Reference Architecture, ...

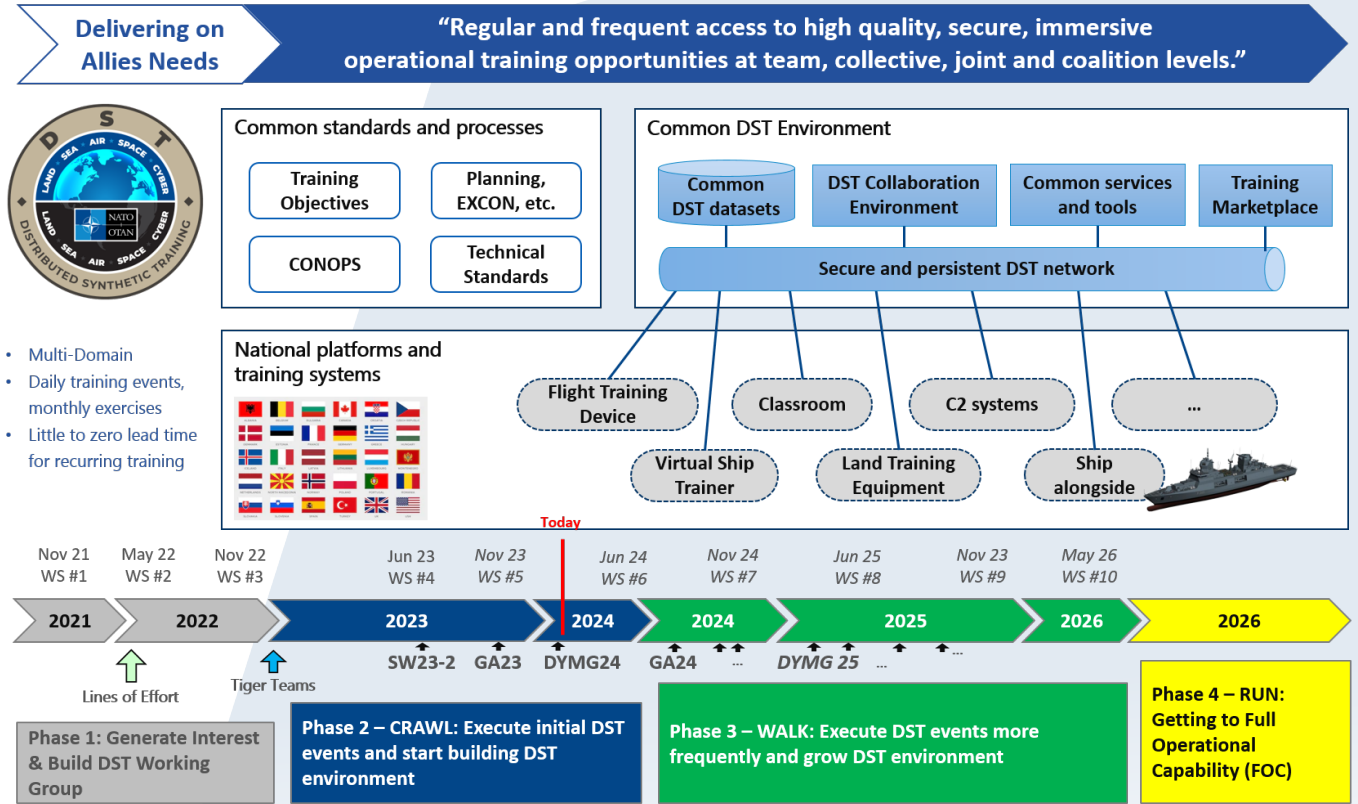


NMSG/ SISO Technical Cooperation Agreement, Revised and signed in Dec 2019 at I/ITSEC Orlando FL, USA

What's to come next: NATO MSaaS Ecosystem Standardisation Series; M&S Security standards; DST for MDO.

Distributed Synthetic Training (DST) Focus Area

- NMSG developed NATO DST initiative to train multi-domain force elements in readiness for NATO operations
 - Designed to ensure cohesion and integration at the tactical level
- Some 18 Nations (and growing) currently participate in NATO DST NATO operations



"Regular and frequent access to high quality, secure, immersive operational training opportunities at team, collective, joint and coalition levels."

M&S for Operational Mission/Decision Support Focus Area

- M&S for Operational Mission/Decision Support provides commanders, warfighters, analysts and planners with a **flexible M&S toolset** and methodology that supports military decision-making **prior to (planning) and during missions (execution)**.
- Military decision makers or analysts would access the M&S toolset through their planning or C2 system.
- Data sharing across the Alliance is a key element for the M&S toolset.

Concept Development & Experimentation Focus Area

- M&S for Concept Development & Experimentation to explore the problem space, discover, develop and refine new or innovative concepts, test hypotheses, or validate potential solutions to meet capability shortfalls or gaps.
- Many nations already operate Battle Lab to develop doctrine and tactics, analyse operational requirements, and support materiel acquisition.
- Reduce duplication of effort across the Alliance by leverage existing simulation capabilities in national battle labs and promote the collaborative development of solutions.

Recent Challenges to the NATO STO Collaborative Programme

- Cognitive Warfare (led by NOR)
- Hypersonics (led by DEU)
- Climate Change (led by CAN)
- Weak Signals and S&T Foresight - (led by GBR)
- Quantum (led by NLD)
- Resilience (led by FIN) – starts 2024



Resilience

- Persistence in the ability of a system to function, over time, in the presence of disruptions.



- 7 baseline requirements

1. Assured **continuity of government and critical government services**;
2. Resilient **energy supplies**;
3. Ability to deal with **uncontrolled movement of people**;
4. Resilient **food and water resources**;
5. Ability to deal with **mass casualties**;
6. Resilient **civil communications systems**;
7. Resilient **civil transportation systems**;

- M&S need: **Systems of systems model of resilience in operating environment**

Emerging M&S challenges arising from Operating Concepts

- Training for Cognitive Superiority: Modelling and simulation to enhance training and build resilience
- Education and Training of Future Commanders for Multi Domain Operations
- Develop the models to define the influence of the population on military leaders
- Trusted Data: Developing standards for interoperable, seamless, trustworthy data shared
- Visualization of likely outcomes to operational decision makers
- M&S generated datasets for testing/training generative AI systems

NMSG Technology Watch Card

#	Title
01	Large Complex Synthetic Environments
02	Scalable Cloud- and Service-based Approaches
03	Deep Immersion Human Interfaces
04	Artificial Intelligence (AI) for Advanced Data Processing and Analytics
05	Artificial Intelligence (AI) for Model Representation
06	Artificial Intelligence (AI) supporting Content Creation and Delivery
07	Ubiquitous Secure Reliable Connectivity
08	Blending of Synthetic Environment Categories
09	Large Scale Advanced Human-Machine Teaming
10	Advanced Modelling Techniques
11	Novel Infrastructures
12	Modelling & Simulation for Digital Twins

New Activities - since SIW Feb 2023 (1)

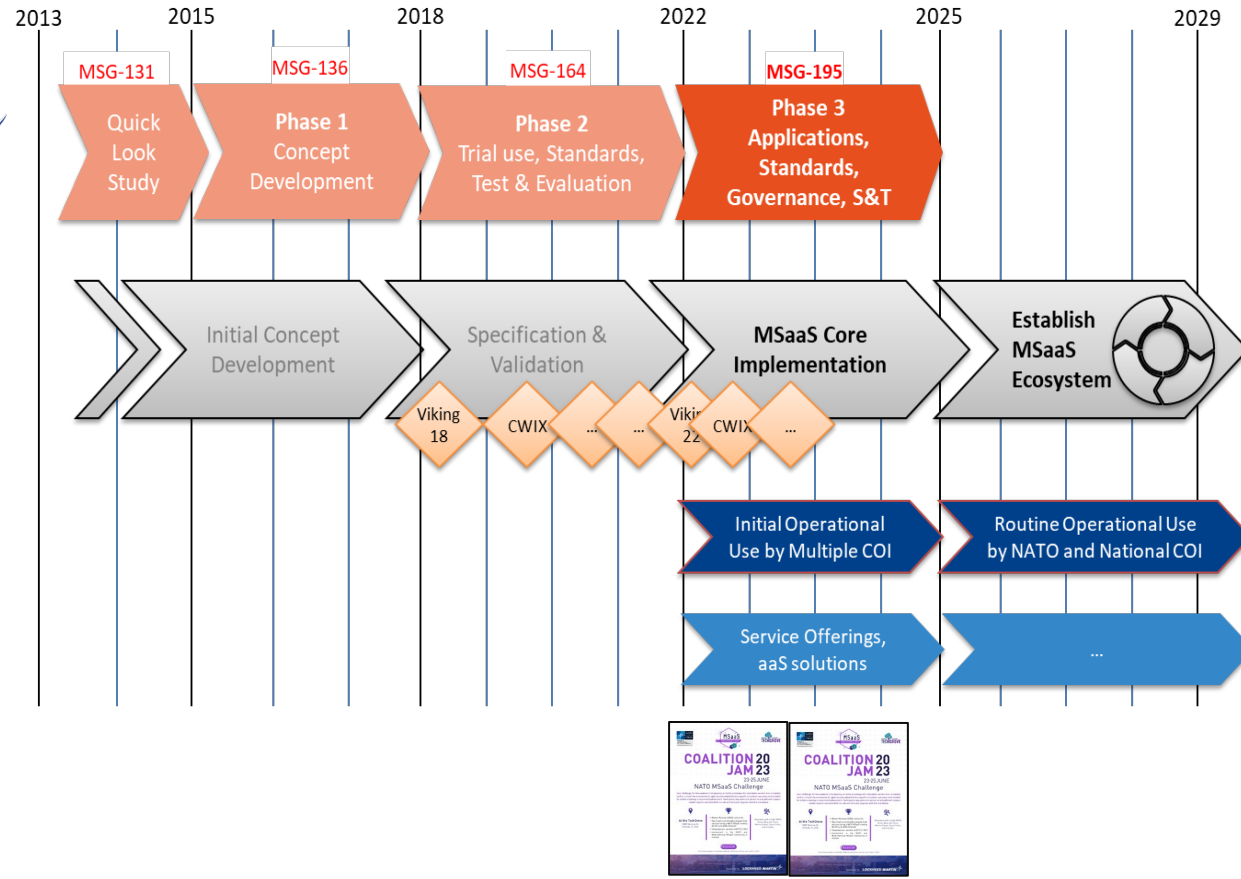
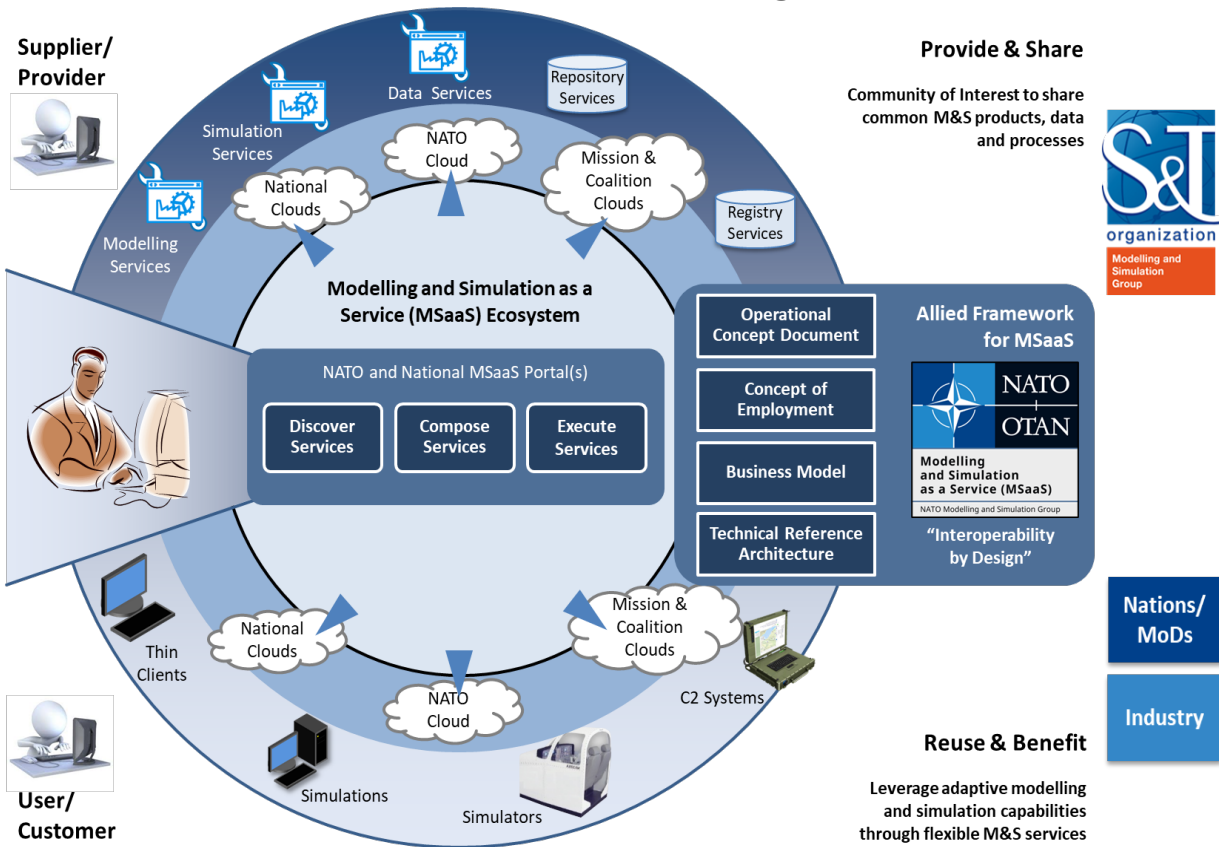
ID – Activity Type	Activity title	Lead NATO Nation/Org
MSG-219 - ST	Domain Specific Language (DSL) for Modelling & Simulation (M&S)	USA
MSG-221 -TG	M&S in support of Building Resilience and Management of People Mass Movement	CMDR COE
MSG-222 - TG	Representing Human Behaviour and Decision-making in Modelling and Simulation	UK+USA
MSG-ET-055	Representing Electronic Warfare as part of Multi-Domain Operations in Modelling and Simulation Systems	UK

New Activities - since SIW Feb 2023 (2)

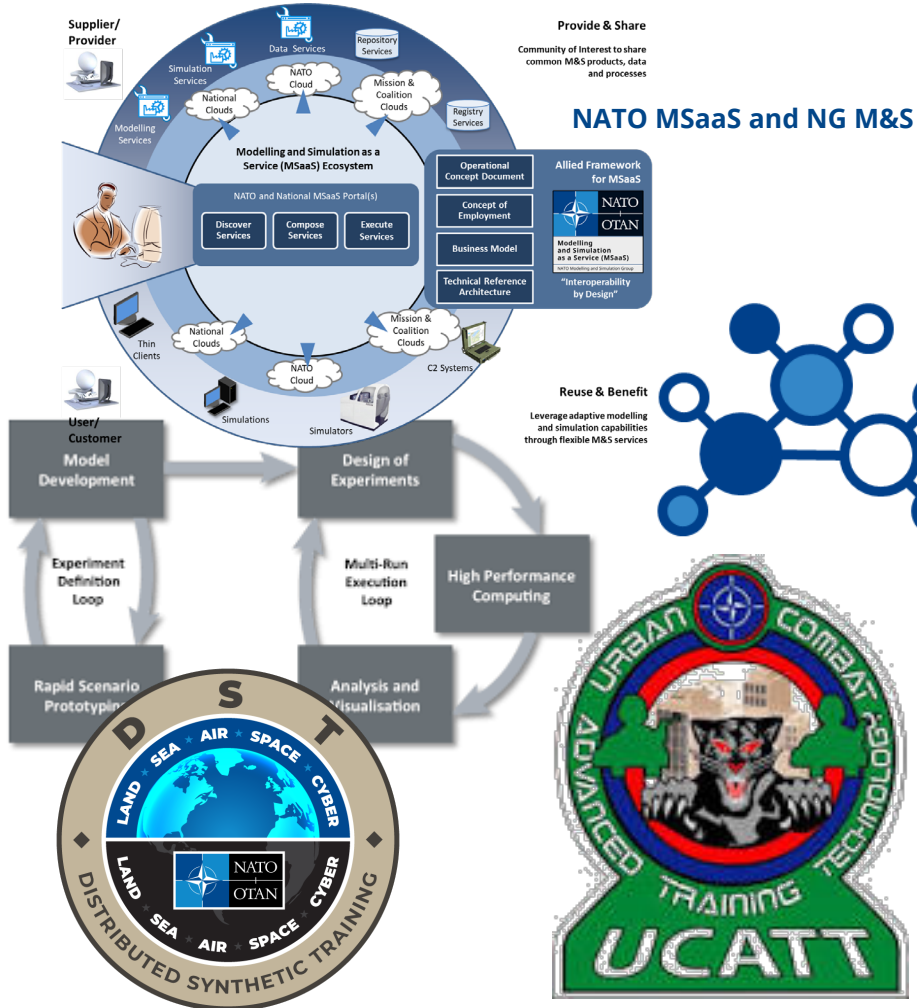
ID – Activity Type	Activity Title	Lead Nation
MSG-HFM-220 - ST	Effectiveness of Medical Training based on eXtended Reality	AUT
MSG-SCI-nnn - TG	Common synthetic environment for validation (or operation) of offensive and defensive architectures for Hypersonic Operational Threats (HOT)	TBD
MSG-AVT-ET-054	Unified network architecture and interface declaration for live fire exercise systems on shooting ranges and military training areas	DEU
HFM-MSG-375- SM	Human Digital Twin in the Military: findings and perspectives	USA
IST-AVT-MSG-SCI -TG	Tools and Methods for Analyzing Cyber Security for Federated Autonomous Vehicles	TBD

M&S as a Service (MSaaS) - Phase 3 (MSG-195)

M&S as a Service (MSaaS) is an enterprise-level approach for discovery, composition, execution and management of M&S services.



There's a lot more!



Federated Mission Networking

NATO Modelling & Simulation Group

Research & Development of Standards, Guidance, Products and Services for M&S

NATO M&S

Efficient and effective use of NATO and national Modelling & Simulation (M&S) capabilities requires policies, common services, shared data and standards for interoperability and reuse.



NMSG

NATO Modelling and Simulation Group



NATO M&S Master Plan

Modelling and Simulation Strategic- and Implementation Plans for the Alliance



Research & Development

Collaborative R&D developing and improving M&S for NATO and partners



Standards & Guidance

Allied Modelling and Simulation Publications, Standard Agreements (STANAG) and Standard Recommendations (STANREC) for M&S.



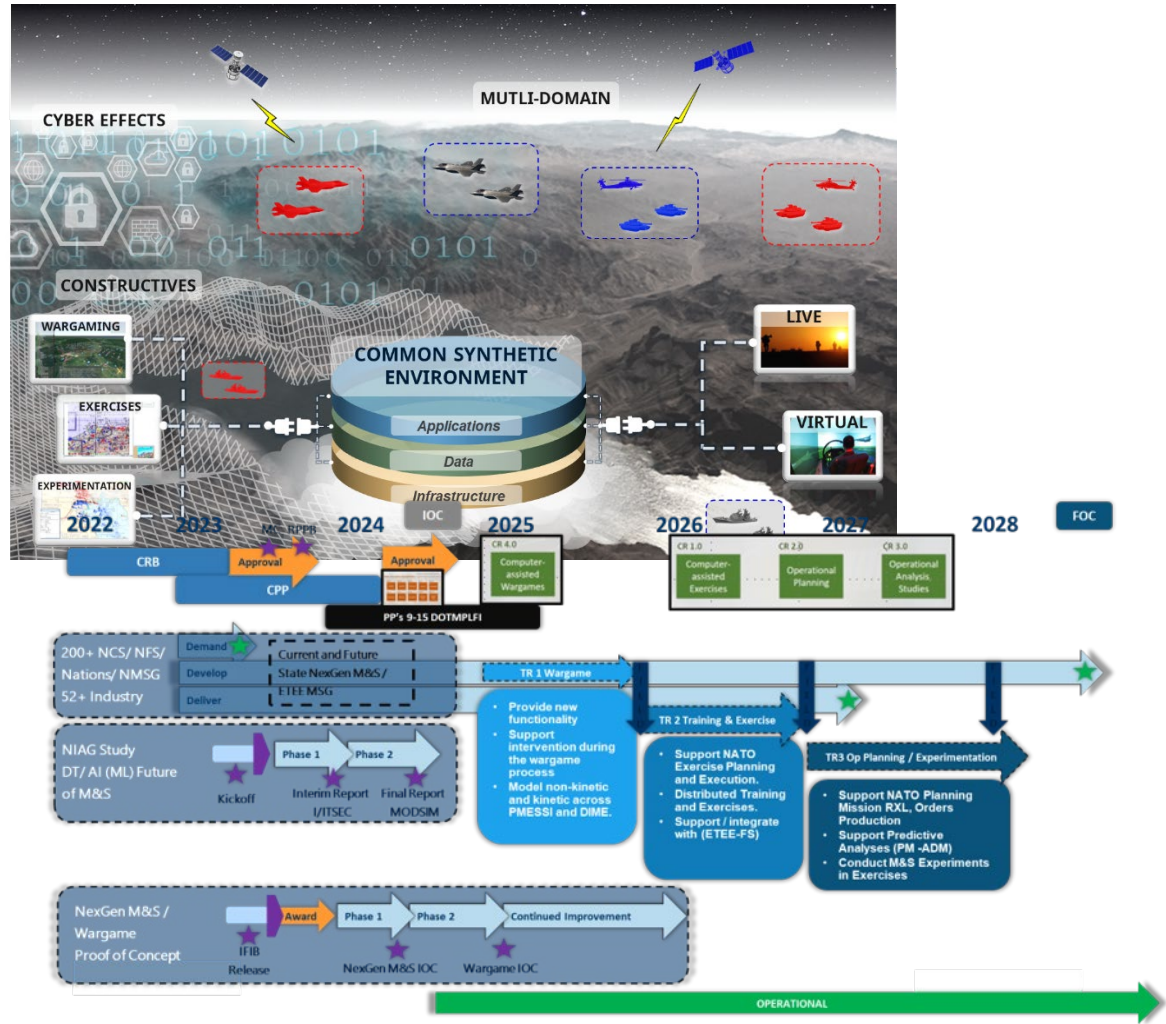
Products & Services

Data, Software and Services for Modelling and Simulation

<http://nmsg.sto.nato.int>

NATO ACT NexGen M&S Capability

- NMSG is a key supporting stakeholder
- Exploits NMSG outputs (e.g. MSaaS) and standards
- NIAG study to get Industry view
- Seeking a Host Nation for programmatic services to deliver NexGen M&S capability



S&T Trends 2023-2043

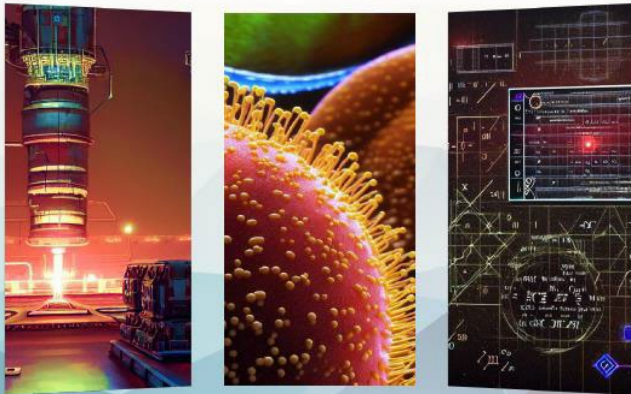


Science & Technology Trends 2023-2043

Across the Physical, Biological and Information Domains

NATO Science & Technology Organization

VOLUME 1: Overview



STT 2023 Vol. 1



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NATO Science & Technology Organization

VOLUME 2: Analysis



STT 2023 Vol. 2

CALL FOR PAPERS

NMSG SYMPOSIUM

Modelling and Simulation as enabler
for Digital Transformation
in NATO and Nations

24-25 October 2024 in La Spezia, Italy

Find out more online
events.sto.nato.int

Submission deadline
30 April 2024



For any other info please contact
msg@cs0.nato.int



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