

MSG-197 Symposium

A synthetic war-game environment to assess emerging and disruptive maritime technologies in NATO exercises

G.L. Maglione, T. Mansfield, P. Caamano, A. Carrera, A. Tremori | NATO STO CMRE

S. Da Deppo | NATO ACT Innovation Hub

DTEX

20-21 October 2022 | Bath, UK

Introduction

20 minutes to present...

DTEX & Dynamic
Messenger

A reusable development
framework

The DYMS wargame design

Wargame testing

Conclusions and next steps

- What is **DTEX**? How is it supporting  ?

- Design of the wargame and the synthetic environment.

- Playing the wargame to analyse Naval Mine Warfare technologies in 



DTEX & Dynamic Messenger

A reusable development
framework

The DYMS wargame design

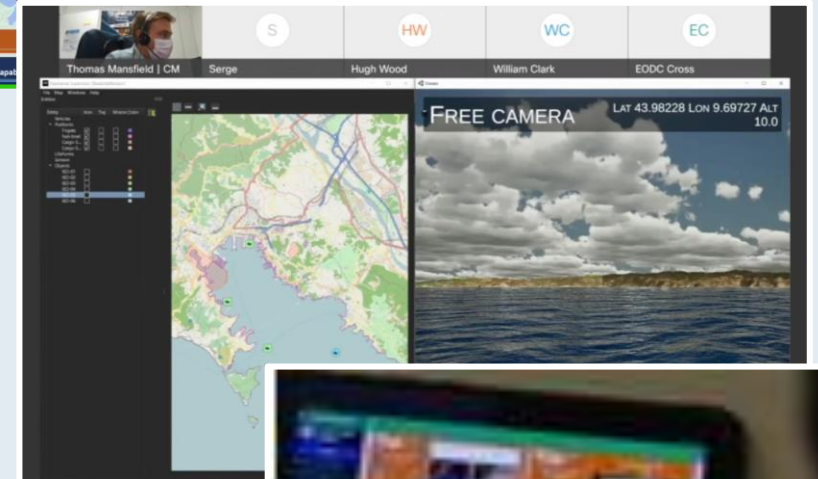
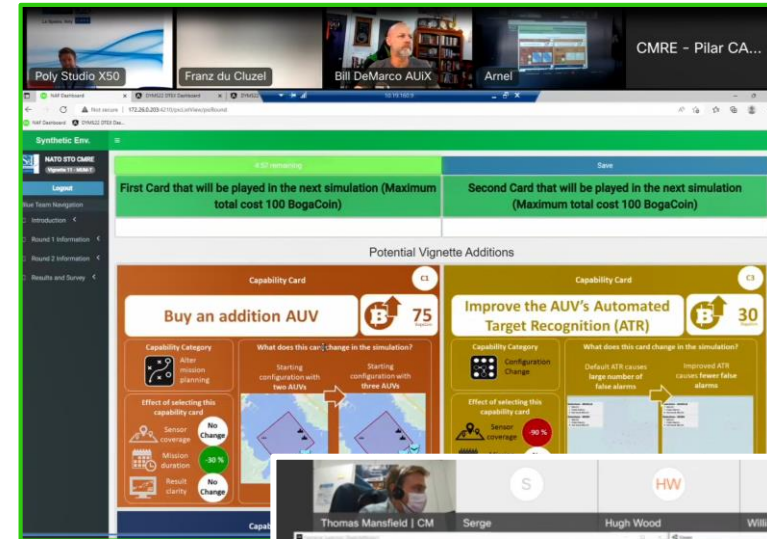
Wargame testing

Conclusions and next steps

- What is **DTEX** ?
- How is it supporting  ?

What is DTEX?

- **DTEX** means “Disruptive Technology EXperiment”
- **DTEX** aims to inform NATO about **new technologies**, **new concepts** and **new capabilities** that could be useful in the future.
- **DTEX** events presents ideas as capability cards in a gamified setting so that we can rapidly game out the best ideas.
- **DTEX** is a multi-year project, with a number of events held in recent years.
- **DTEX** is an innovative approach to war-gaming.



Examples: The last two DTEX events

DTEX Topic: Trust in Autonomous Systems

Event Date: Autumn 2021




Players: Game Design Students - ODU



DTEX Topic: DYMS 22 (Trial event)

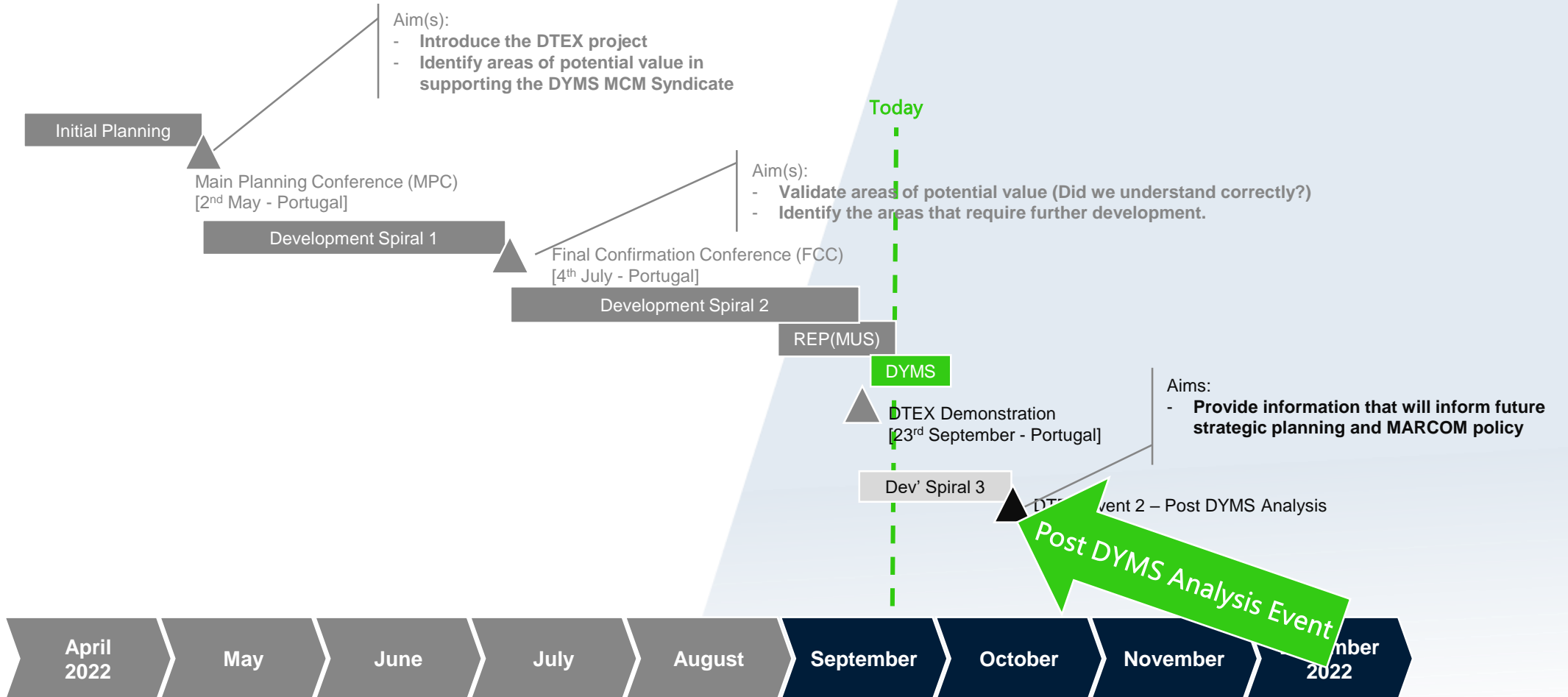
Event Date: Summer 2022

Players: Naval Mine Warfare Operators and End Users

- 1 x server 
- TCP/IP network 
- 3 x Internet browser 



Plan: 2022 DTEX support to DYMS





DTEX & Dynamic
Messenger

A reusable development
framework

The DYMS wargame design

Wargame testing

Conclusions and next steps

- **Design of the wargame and
the synthetic environment.**

A reusable development framework: Three development streams

The **DTEX** Technology Stream:
Distributed toolsets to support events

The **DTEX** Human Stream:
Tailored interfaces and data for diverse communities

The **DTEX** Gameplay Stream:
Engaging and motivating war-games

Today

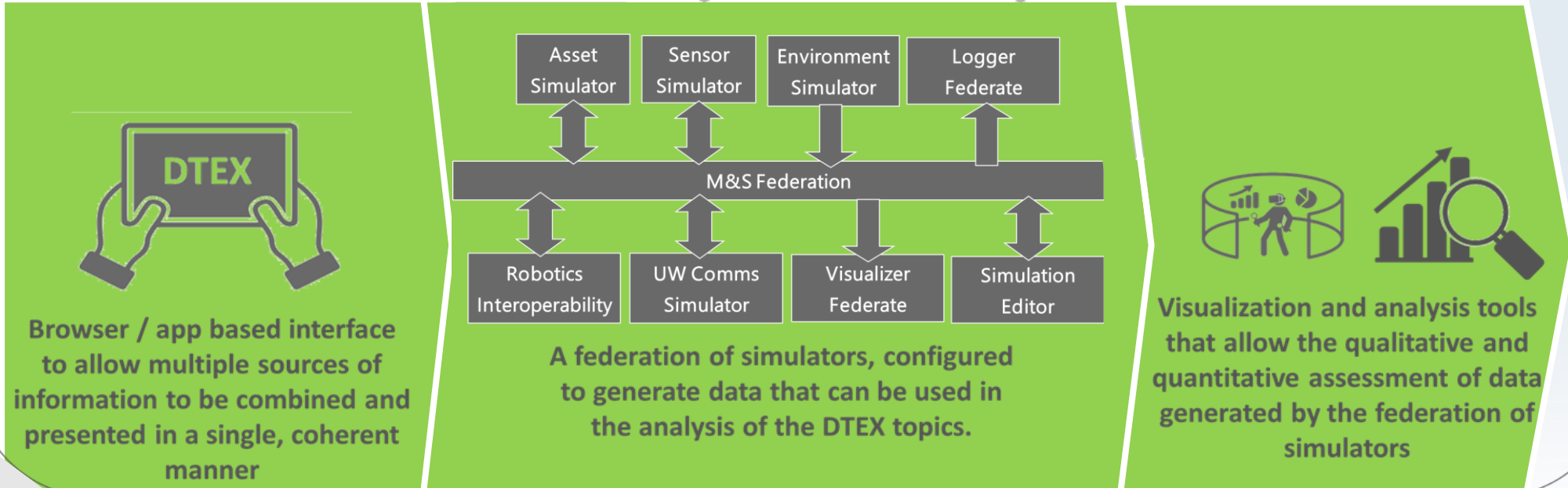
Optimized Assessment of technologies,
concepts and capabilities

The DTEX Synthetic Environment



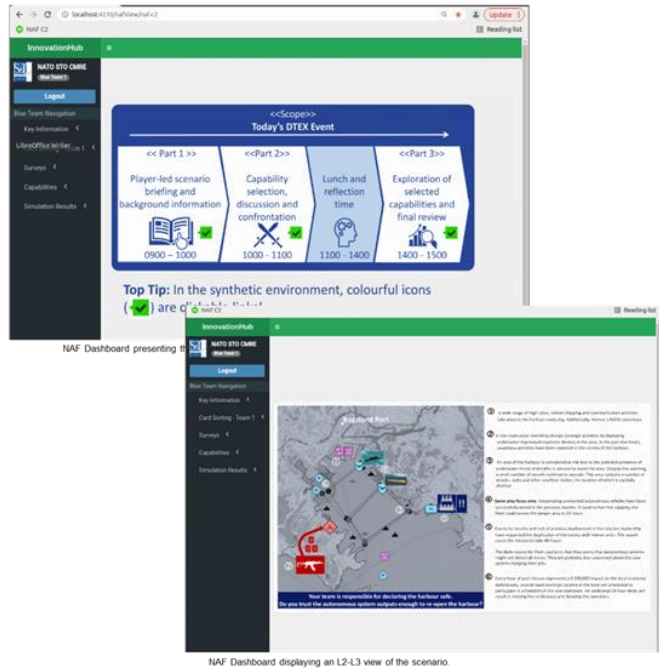
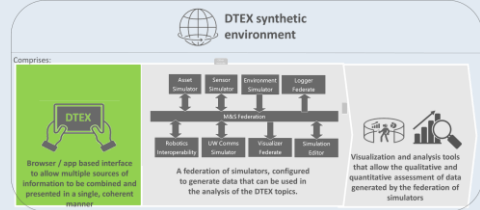
DTEX synthetic environment

Comprises:












The NAF Dashboard

NATO Architectural Framework (NAF) Dashboard

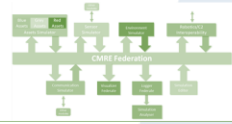


Recap of November 2021 DTEX (Held on-site in Norfolk, VA)

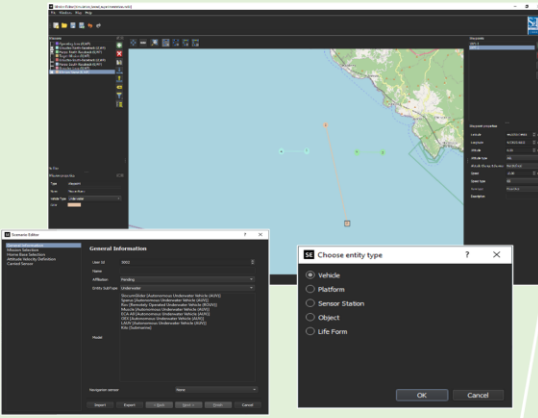
Gameplay Stream	 Scenario Briefing, Tech Tinder, Card Sorting, Confrontation	 Simulation executed using shortlisted technologies to generate data	 Review and discuss simulation outputs to select final technologies
Technology Stream	 The NAF-Dashboard hosted on local server and shown on 3 tablets.	 CMRE's maritime federation, running on a M&S server, used to generate data set.	 User friendly data analysis tools used to explore the effects of the technologies.
Human Stream	 Players (Discussing in teams)	 Facilitator / M&S expert	 Facilitator and players in joint discussion
	10:00	November 2021 Event	15:00

The Federation of Simulators

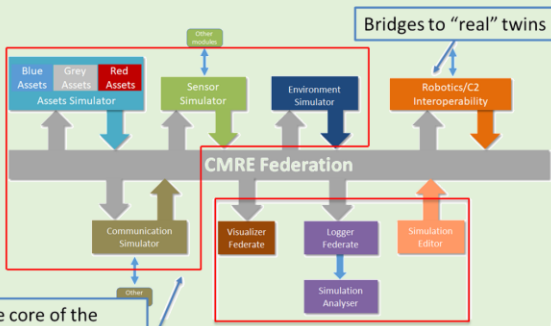
M&S Federation



Users are free to configure assets, sensors, environments and missions



The configurations are simulated in real or fast time within a federation of simulators

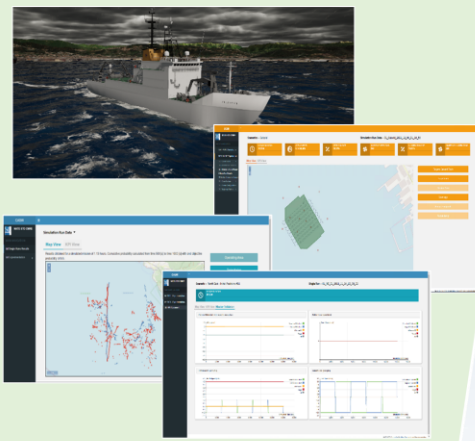


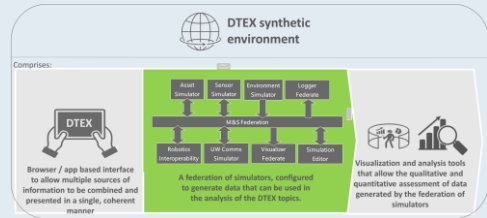
Bridges to "real" twins

The core of the simulated scenario:

- The environment
- What is in
- How it senses
- How it communicates

The data generated by the simulation is presented in a range of human-friendly formats and displays





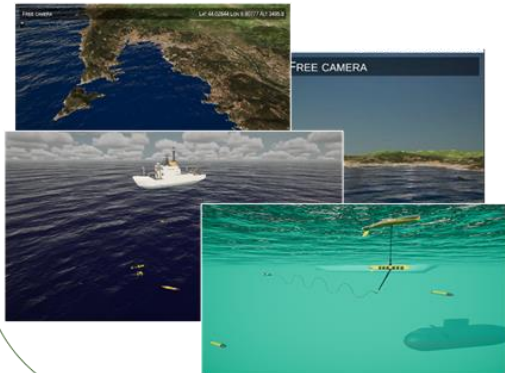
Data Analysis Tools

Visualization and Analysis Tools

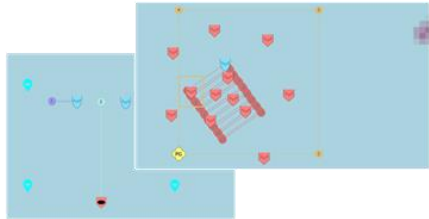


Comprises:

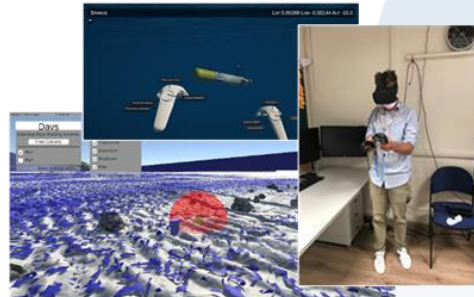
3D visualization of real time scenario progression



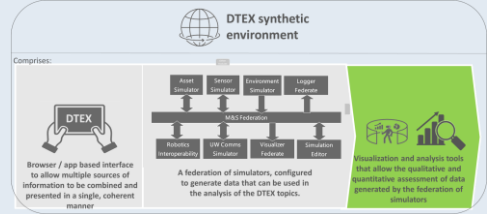
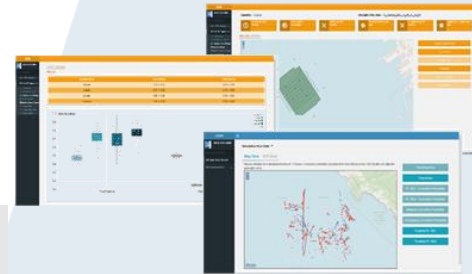
2D visualization of asset types, locations, headings and mission plans



Virtual reality environments to assist with data analysis and situational awareness



2D visualization of asset types, locations, headings and mission plans



The Human Stream

- NAF dashboard used as a basis for tailoring information for different audiences.
- Further techniques trialed for specific audiences
- A particular area of interest for the support to DYMS 22.

The **DTEX** Technology Stream:
Distributed toolsets to support events

The **DTEX** Human Stream:
Tailored interfaces and data for diverse communities

The **DTEX** Gameplay Stream:
Engaging and motivating war-games



Military
Operators



Civilian
Operators



Technology
Providers

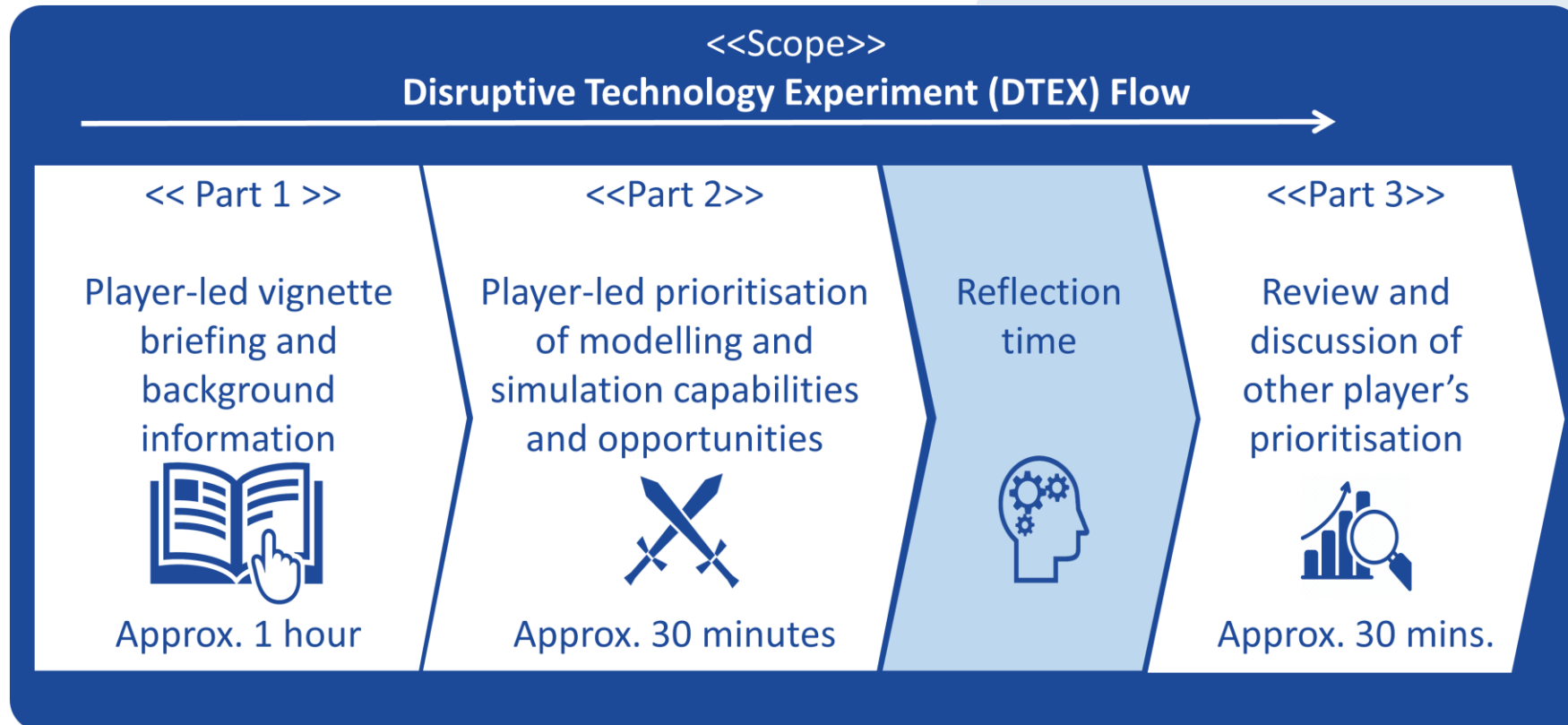


Students /
Academia



[...]

Gameplay Stream





DTEX & Dynamic
Messenger

A reusable development
framework

The DYMS wargame design

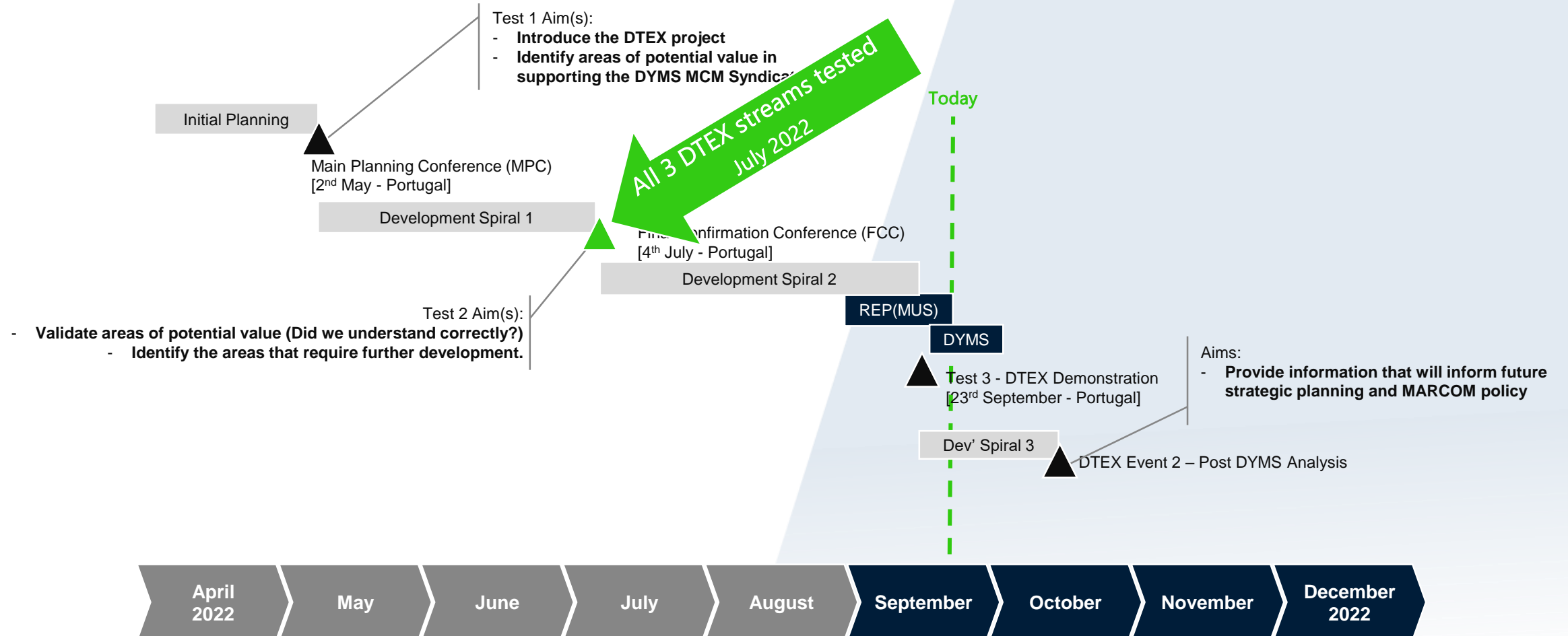
Wargame testing

Conclusions and next steps

- **Playing the wargame to
analyse Naval Mine Warfare
technologies in**



Wargame testing



Human Stream Observations / Test Outputs

Key quotes

“DYMS is a very controlled environment. There are no fishing nets and no obstacles. That’s not real. What happens if there are fishing nets? How are the KPI’s affected? What can we do to mitigate it?”

“We will have asset failures in DYMS. Can we identify the critical points in the architecture? What is the impact of asset loss on the KPIs? Can we mitigate it in mission?”

“DYMS may give a perception that MUS technologies are mature and robust. How do we communicate the fact that there are still potential weaknesses with MUS in operations.”

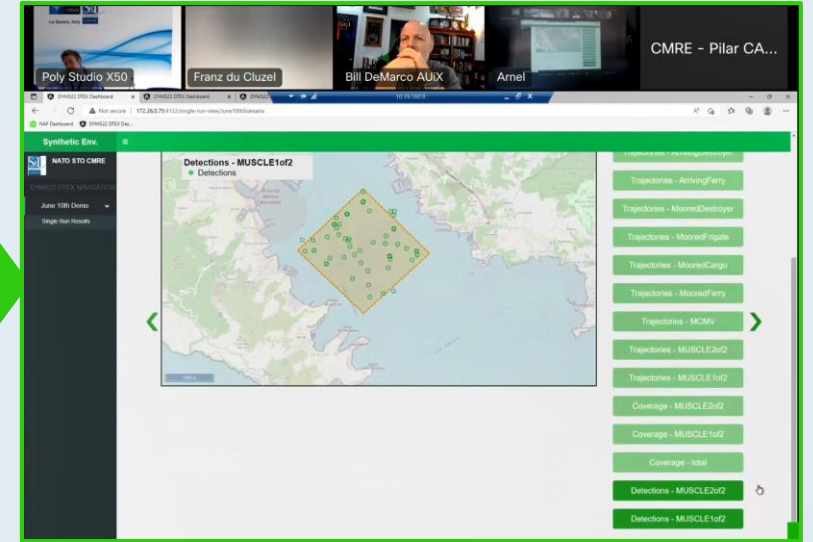
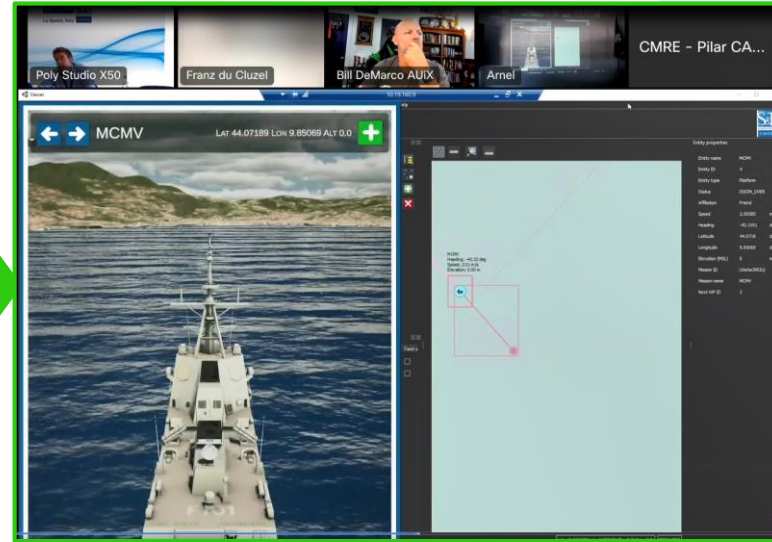
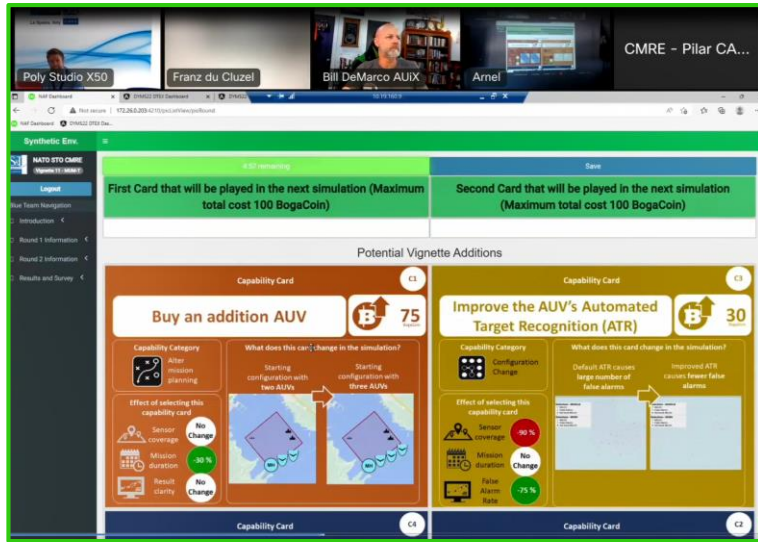
“We choose Sesimbra in September because there are no waves, the weather is calm and the sea floor is benign. What happens to the KPIs if the environment is not benign? How can we mitigate the impacts?”

“In DYMS, each nation is working on their own with their own. What’s the benefit or working together? How does working together improve the KPI’s?”

Identified areas of potential value

- Augmenting the DYMS scenarios with additional (harsh / hostile) features and assessing the impact in the KPIs
- Communicating the capabilities and limitations of MUS technologies to non-MCM experts
- Identifying how best to use MUS technologies (Inc. understanding their capabilities and limitations)
- Identifying architectural trade-offs

Technology Stream Observations / Test Outputs



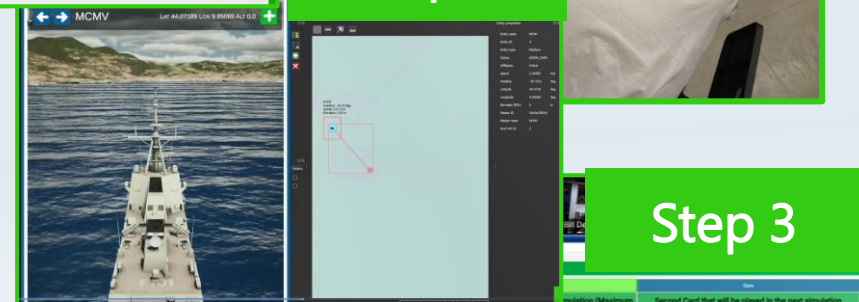
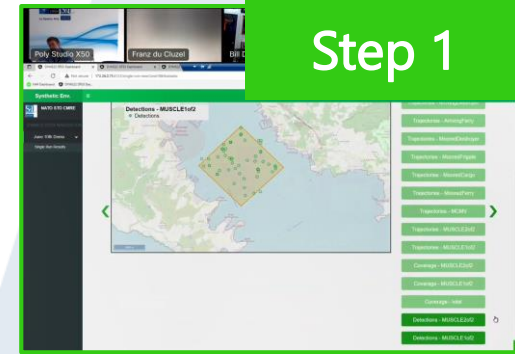
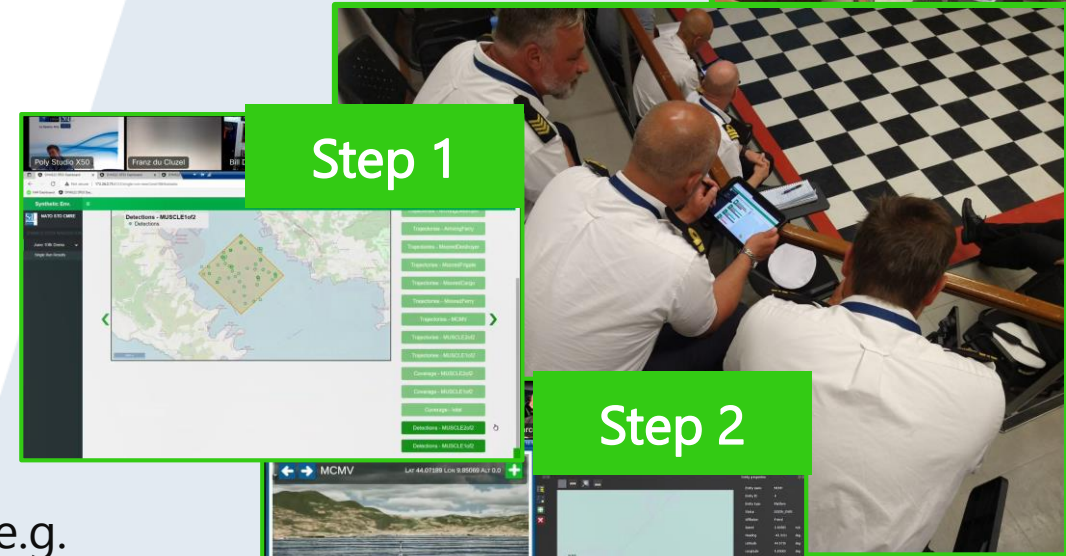
NATO Architectural Framework Dashboard to set the context and alter the configuration.

M&S federation to simulate the effects of your choices.

Tools to analyse the impact of your decisions on the KPIs

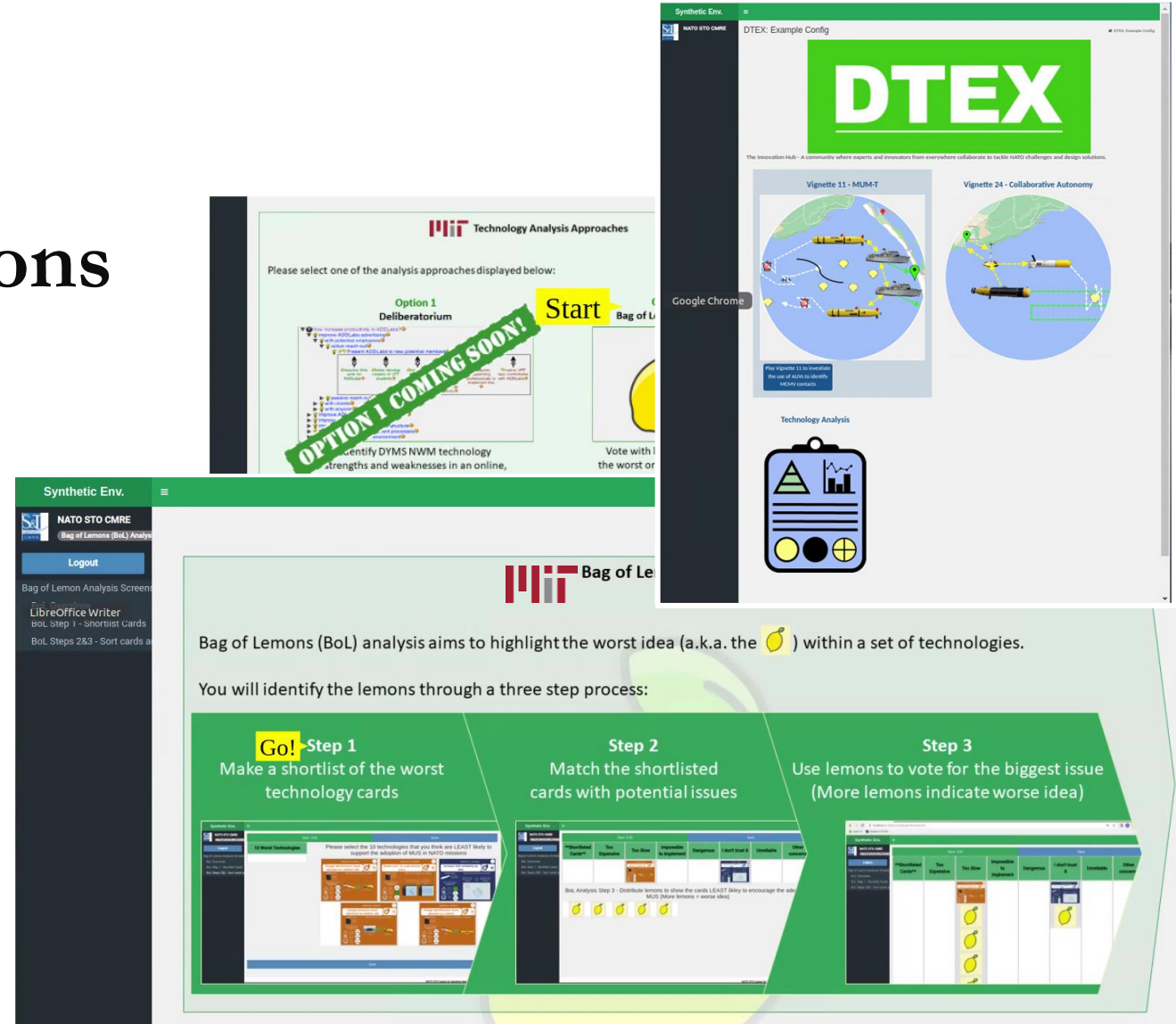
Gameplay Stream Observations / Test Outputs

- Four teams of DYMS MUS operators and end users played through the stages of the DTEX event.
- To relate the synthetic environment content to the live DYMS operations, the following steps were implemented:
 - **Step 1** – Use the synthetic environment to simulate and display the expected / obtained system KPI values.
 - **Step 2** – Simulate performance in a hostile environment (e.g. poor weather, fishing nets, etc) and show the effect on KPIs.
 - **Step 3** – Allow players to alter the configuration of the systems to try to improve the KPI values (Showing relative performance of each team).



Gameplay Stream Observations / Test Outputs

- Working with our project partners at the Massachusetts Institute of Technology (MIT), an additional analysis element has been added to the DTEX event.
- Using the principle that players find it easier to identify problems with technologies, they vote with lemons (🍋) based on the MIT Bag of Lemons approach.
- This round elicits further information about the DYMS technologies within the synthetic environment.



OPTION 1 COMING SOON!

Start

Bag of Lemons

Technology Analysis Approaches

Please select one of the analysis approaches displayed below:

Option 1 Deliberatorium

Identify DYMS NWM technology strengths and weaknesses in an online, Vote with the worst

Bag of Lemons

Bag of Lemons (BoL) analysis aims to highlight the worst idea (a.k.a. the 🍋) within a set of technologies.

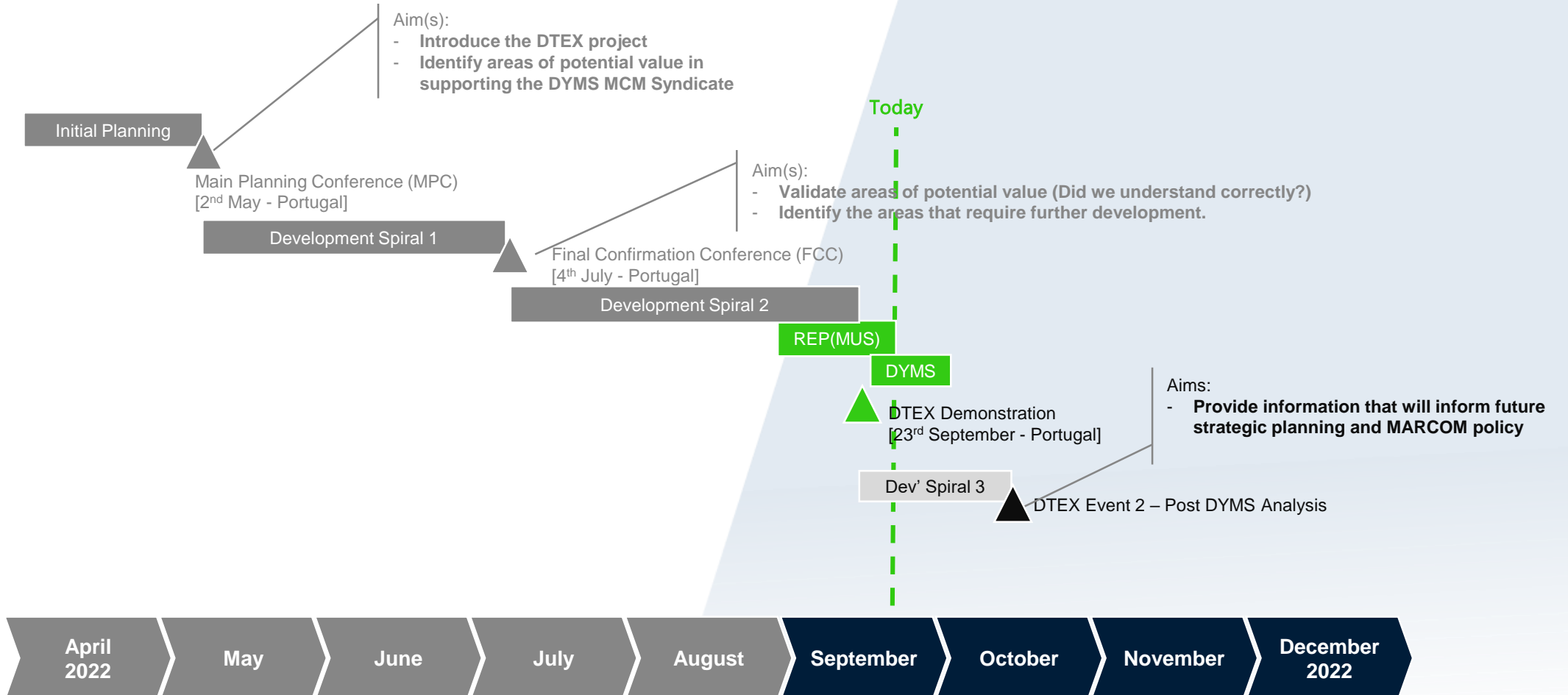
You will identify the lemons through a three step process:

Go! Step 1
Make a shortlist of the worst technology cards

Step 2
Match the shortlisted cards with potential issues

Step 3
Use lemons to vote for the biggest issue (More lemons indicate worse idea)

Latest updates from DYMS 22



Conclusions

- Flexible and reusable framework used to support M&S in wargaming.
- Initial testing of all three DTEX development streams has demonstrated the potential of M&S to support wargaming.
- Further testing in progress ahead of the (Imminent!) Post DYMS DTEX Event.

The **DTEX** Technology Stream:
Distributed toolsets to support events

The **DTEX** Human Stream:
Tailored interfaces and data for diverse communities

The **DTEX** Gameplay Stream:
Engaging and motivating war-games



Thanks!
Questions?