



Accelerating
the future
of aerospace

PYRAMID

**Enabling Interoperable
Multi-Domain Operations
Simulations for Wargaming**

Hajo Erwich





SPACE



CYBERSPACE



AIR

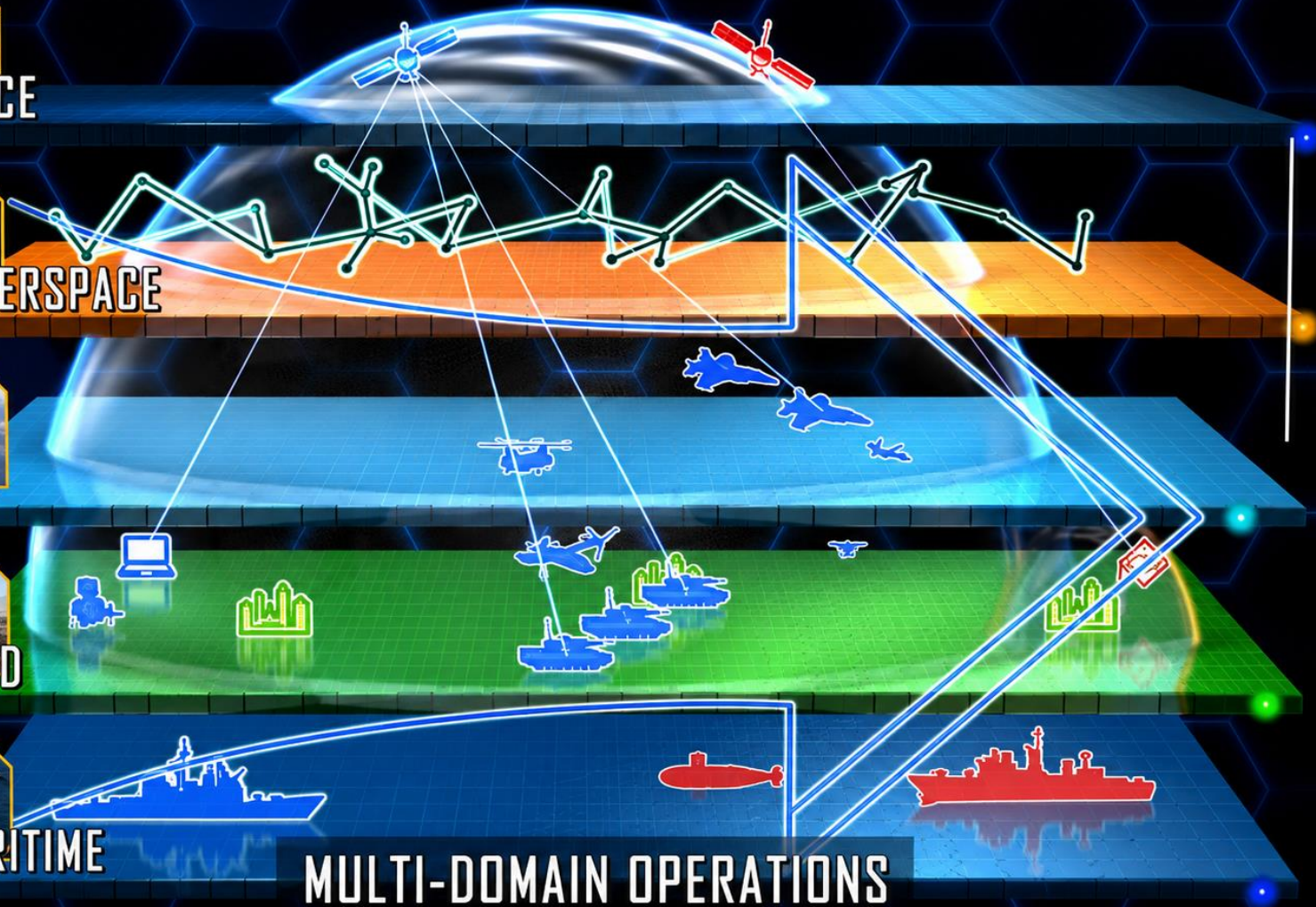


LAND



MARITIME

MULTI-DOMAIN OPERATIONS





Outline

- Background
- System design
- PYRAMID Workflow
- Technical Overview
- Case study: Scenario
- Case study: Setup
- Conclusion



FFI Norwegian Defence
Research Establishment

25/036

FFI-RAPPORT

Simulation of multi-domain operations for experimentation and analysis

– requirements and available tools

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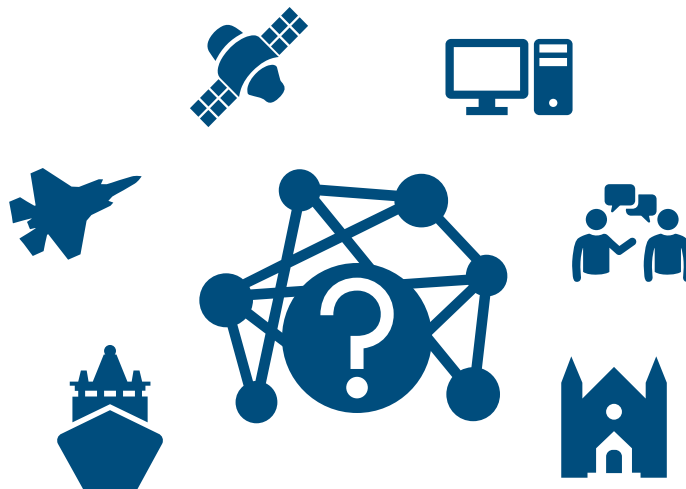
In the past...



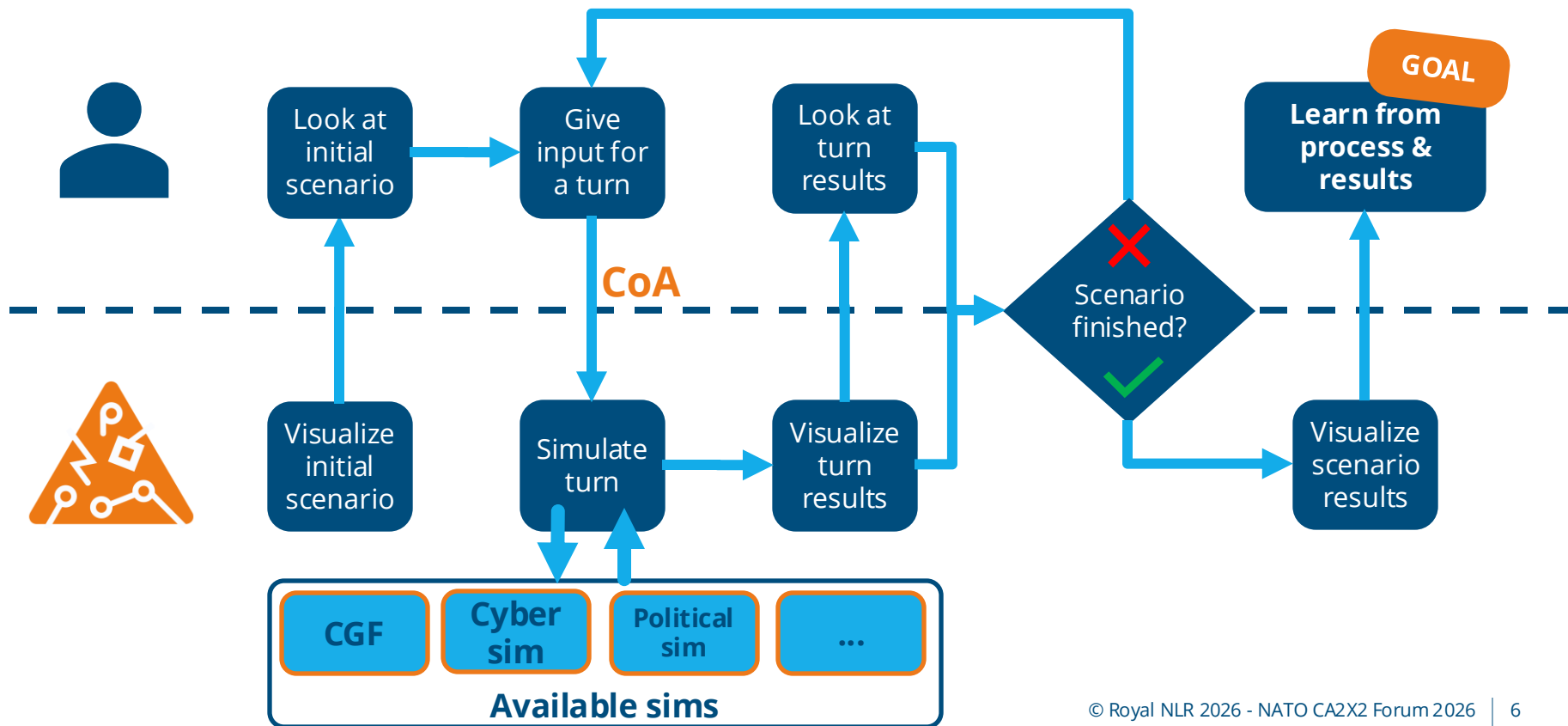
one single
simulation



The future

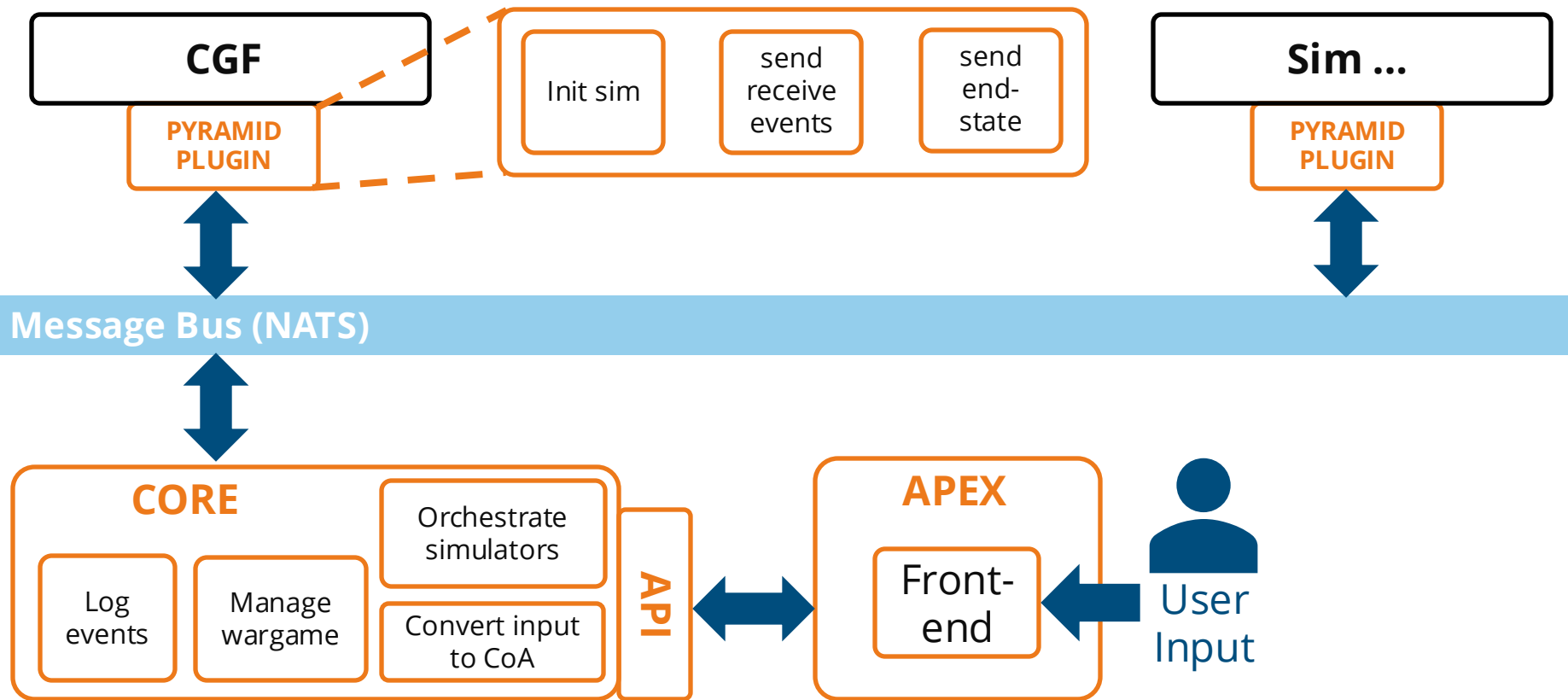


PYRAMID Workflow





Technical Overview





Command Parser Example

"Task hacker group to disable the Neotonian power grid via a DDoS attack."

```
[  // CyberOffenseCommand
  {
    metadata: {
      guid: "da708985-51fd-4e6e-9418-97f16b5a3fa0"  // Unique identifier
      wallClockTime: "2026-07-24Z07:35:27"         // Current wall-clock time
      simulationTime: "2026-03-14Z12:05:21"         // Current simulation time
      timeElapsed: 321                              // Seconds from start of scenario
      source: "Pyramid.Core"
    }
    actor: {
      marking: "hacker group"                        // Name of acting entity
    }
    target: {
      marking: "Neotonian power grid"                // Name of targeted entity
    }
    attack_type: DENIAL_OF_SERVICE                  // Type of cyber offense
    attack_vector: INET                             // Attack vector
    effect: DISABLED                                // Desired outcome
  }
]
```

Case study

The adapted Kadri scenario

Grey State

**Kadri
Airport**

Insurgents

GBAD

**Aleksander
Airbase**

**Air Defense
Squadron**

SOF

Neotonia

The adapted Kadri scenario

Grey State

Kadri
Airport

Internet

GBAD

Aleksander
Airbase

Neotonia

Cyber Command

The adapted Kadri scenario



Kadri
Airport



Aleksander
Airbase



Neotonian
Government

Grey State



Grey State
Government

Neotonia

The adapted Kadri scenario

Grey State



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Squadron

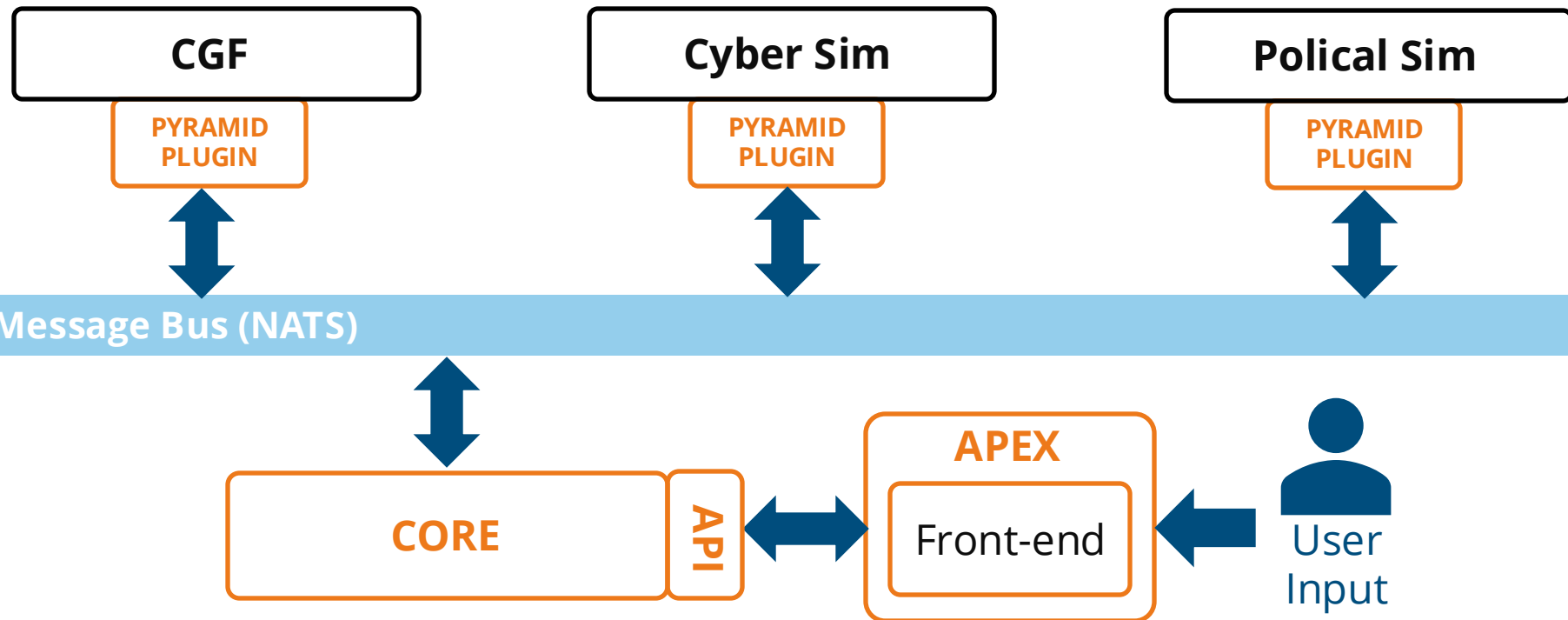
SOF

Neotonia

Neotonian
Government

Cyber Command

Case study implementation



ENTITIES (15)

51.677°N
4.256°E

FRIENDLY

CHARLIE-3
51.358°N
4.278°E

FRIENDLY

DELTA-4
51.847°N
4.802°E

FRIENDLY

ECHO-5
51.590°N
4.172°E

FRIENDLY

FOXTROT-6
51.125°N
3.885°E

FRIENDLY

ENEMY (5)

BANDIT-1
51.725°N
4.248°E

ENEMY

BANDIT-2
51.556°N
3.644°E

ENEMY

HOSTILE-3
52.869°N
3.057°E

ENEMY

HOSTILE-4
51.850°N
4.624°E

ENEMY

THREAT-5
51.359°N
4.181°E

ENEMY

NEUTRAL (2)

MERCHANT-1
51.860°N
4.321°E

NEUTRAL

CIVILIAN-2
51.790°N
5.372°E

NEUTRAL

UNKNOWN (2)

TRACK-001
52.432°N
3.282°E

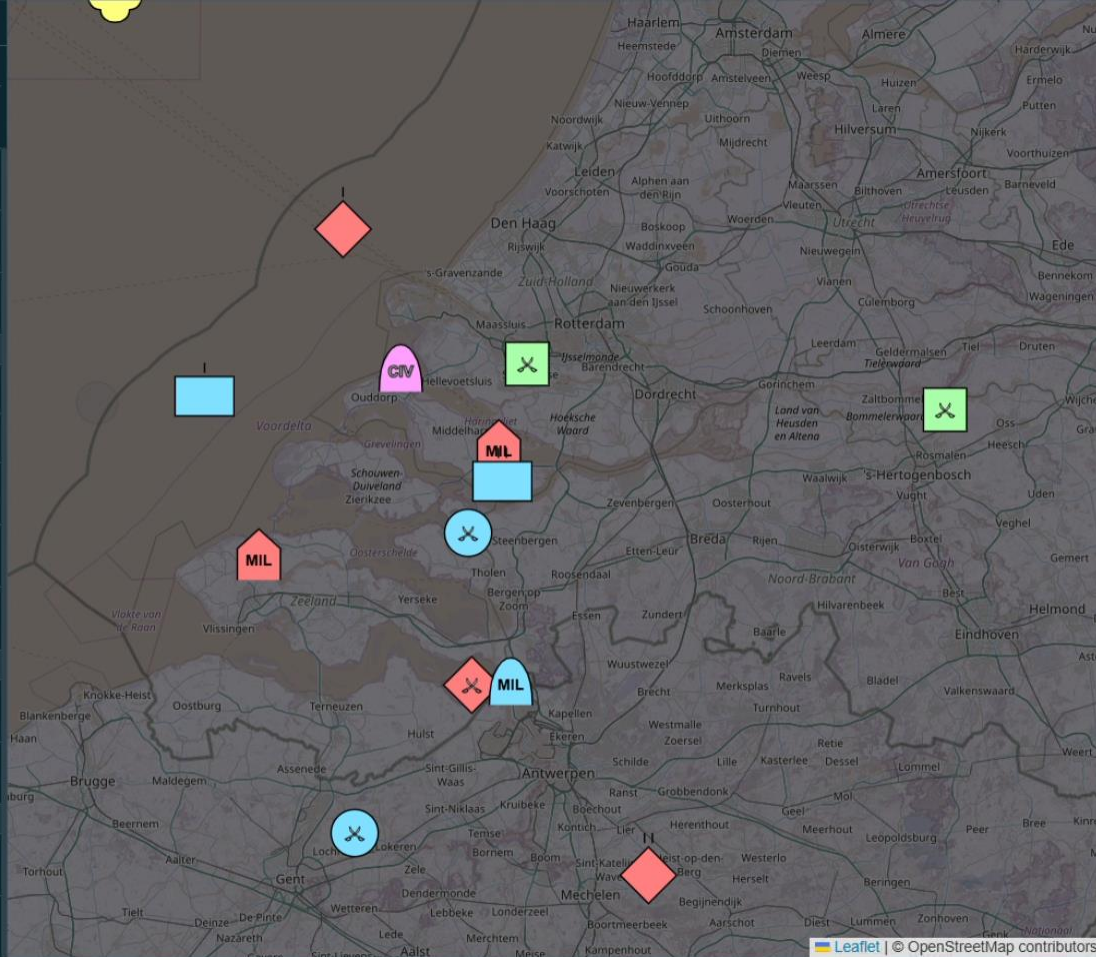
UNKNOWN

TRACK-002
50.749°N
4.148°E

UNKNOWN

TURN 5

T1



DISPOSITION - T1

INITIAL DISPOSITION

T1

ORDERS COMMITTED

ORDERS TRANSMITTED

01 Execute task 1

02 Execute task 2

FORCE COMPOSITION

FRIENDLY

6

ENEMY

5

NEUTRAL

2

UNKNOWN

2

TOTAL ASSETS

15 UNITS

Select any unit on the map or entity list to inspect its position, heading, and status.

ADVERSARY COMPUTING

Parsing tactical parameters...

T:00:01

Map 8 entities are live - use this time to study the field



[Home](#)

CyberTAK-cerebro Log Off

Log Off

☒ Display Statuses

Me

10

Callsign: CyberTAK-cerebro

Unit type: a-f-G-E-V-A-C

Select



Callsign: AH-6

Unit type: a-f-A-M-H-M

Select



Callsign: Aleksander

Unit type: a-f-G-I-B-A

Select



Callsign: CP

Unit type: a-h-G-E-V-A-C

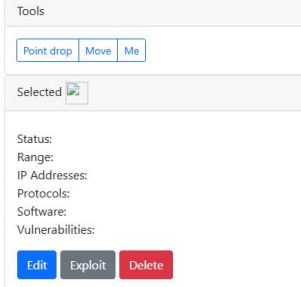
Select



Callsign: EWR

Unit type: a-h-G-E-S-R

Select



Diplomacy: political simulator

Ava Martinez - President (Neotonia)

Televised statement - State TV channel: *We are aware of a recent cyber intrusion targeting our electronic warfare systems. Our cyber security units are actively responding and restoring full operational status. Neotonia remains committed to safeguarding its defenses and protecting the safety of its citizens.*

Nina Khristova - Interior Minister (Grey State)

Televised statement - State TV channel: *We are fully aware of CyberTAK-cerebro's sabotage of the EWR. The state has already activated counter-measures and will ensure those responsible are swiftly brought to justice. Grey State will not tolerate any attempt to destabilize our sovereign institutions.*

Sebastian Jensen - Secretary General (NATO)

Televised statement - NATO State TV channel: *The recent cyber assault on the European Warning Radar is a stark reminder of the evolving threats we face. NATO has mobilised our cyber defence assets to restore full functionality and is working closely with partner nations to strengthen resilience. We remain steadfast in our commitment to collective defence and will keep all allies fully informed of subsequent developments.*



PYRAMID

- Accessible way to connect simulation tools
- Front-end to facilitate wargaming
- Combine with real/fast-time simulation



Thank you for your attention!



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of aerospace

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