

CBRN Analysis implementation in Ukraine: challenges and solutions

Kopenhagen - 2025

I: INTRODUCTION

Presentation

Presentation caveats:

- 1) Presented material is WIP
- 2) NATO terminology is avoided
- 3) Science terminology might be present
- 4) Some Questions may not be answered due to Operational Classification

CBRN Analysis in the context of Ukrainian military

1. Works **really well IF** working together as a system/integrated in **Situational Awareness* (SA)** systems.
2. Simplifies tracking of large amount of incidents.
3. Simplifies GIS workload on the operator.
4. Enforces NATO standards (which we want).

Issues:

1. Automatic communications require Outlook/IMAP access: currently unfeasible.
2. No agency can provide correctly formatted MET data.
3. Due to security, CANNOT input units onto digital maps.

**Preferred UA term for battlefield management/C2 systems.*

Solution requirements

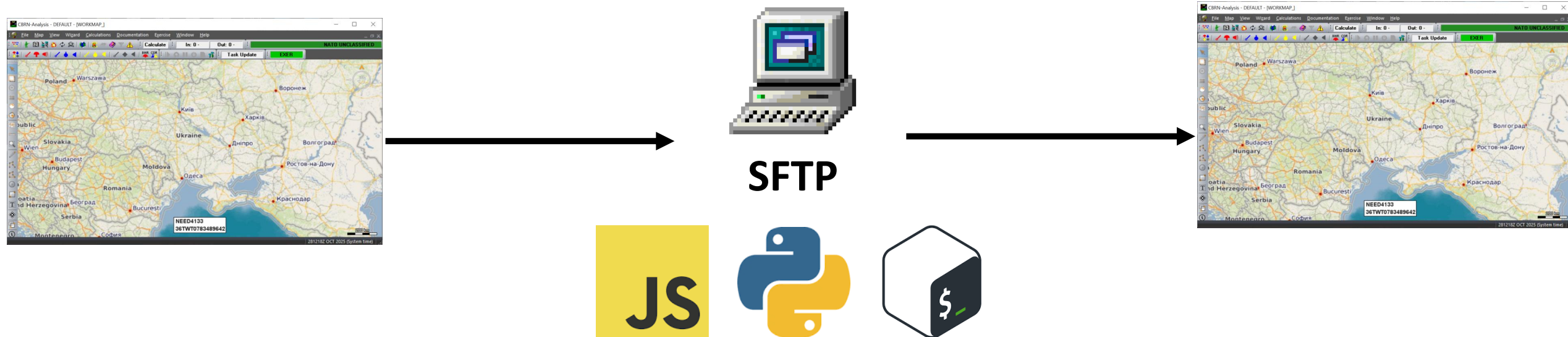
We needed a tool to handle:

- 1) Automatic sending/retrieval of messages using some encrypted channel.
- 2) Ensure some form of integration in SA systems to deal with unit information and other security concerns.
- 3) MET data procurement and dissemination.

II: SOLUTION DEVELOPMENT

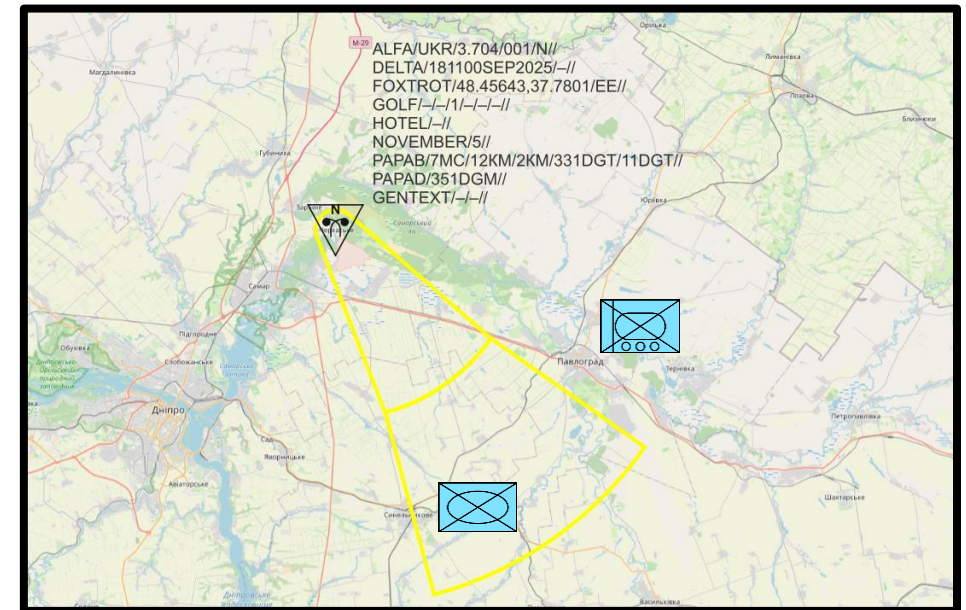
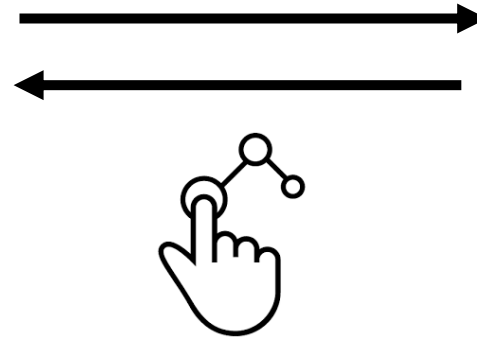
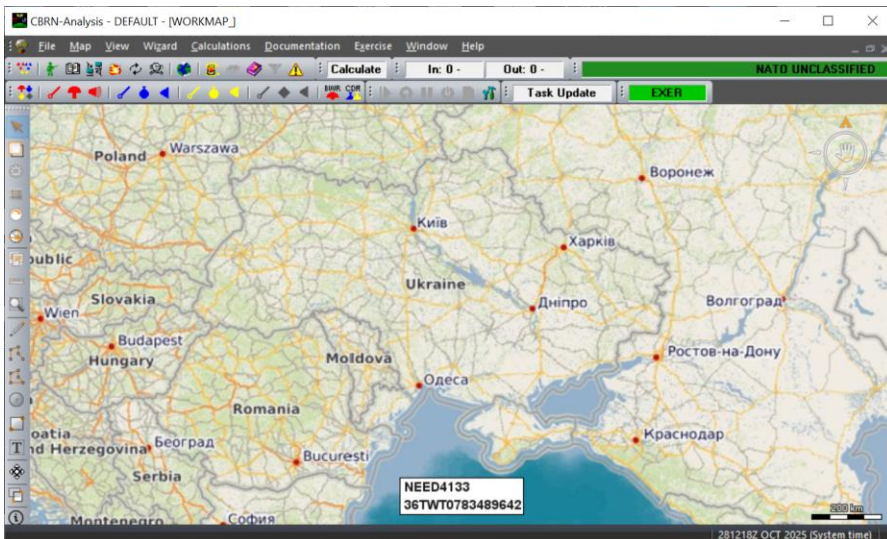
Solution components - COMS

For automatic routine operations: SFTP server



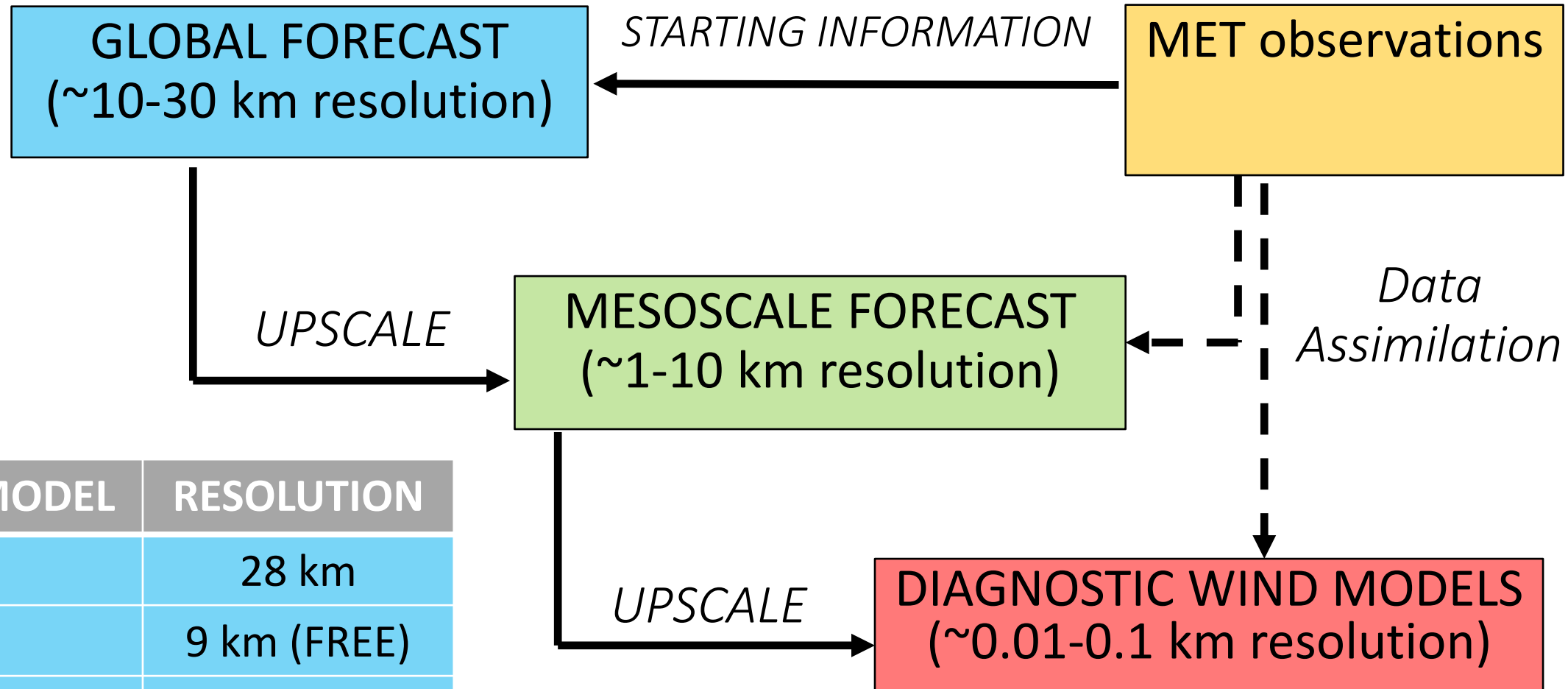
Solution components - COMS

For sensitive operations/ in case of failure: SA
server



Situational Awareness System
(Artist Rendition)

Solution components – MET PROVIDERS



PROVIDER/MODEL	RESOLUTION
NOAA/GFS	28 km
ECMWF	9 km (FREE)
DWD/ICON	7.5 (EUROPE)
WRF (NATIONAL)	3.5-10 km

Solution components – MET VISUALIZATION



Solution components – MET FORMATS

netCDF

PROS:

- 1) Self described
- 2) Easy to process/libraries available
- 3) Used as WRF output

CONS:

- 1) Weights A TON



GRIB/GRIB2

CONS:

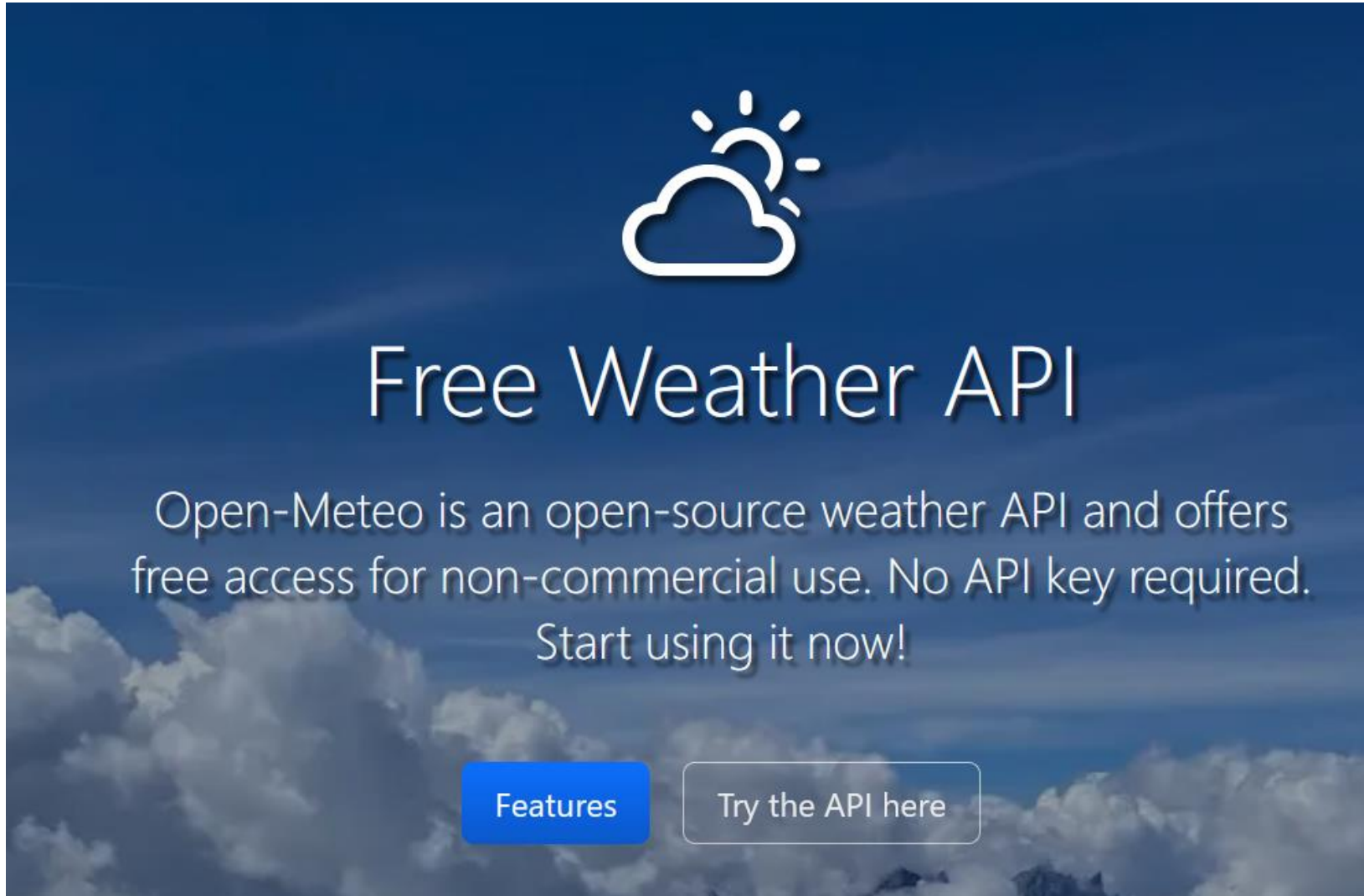
- 1) Encoded
- 2) One arcane library to process (under UNIX)
- 3) Used as output by some providers

PROS:

- 1) Weights a fraction of similar netCDF



Solution components – OPENMETEO

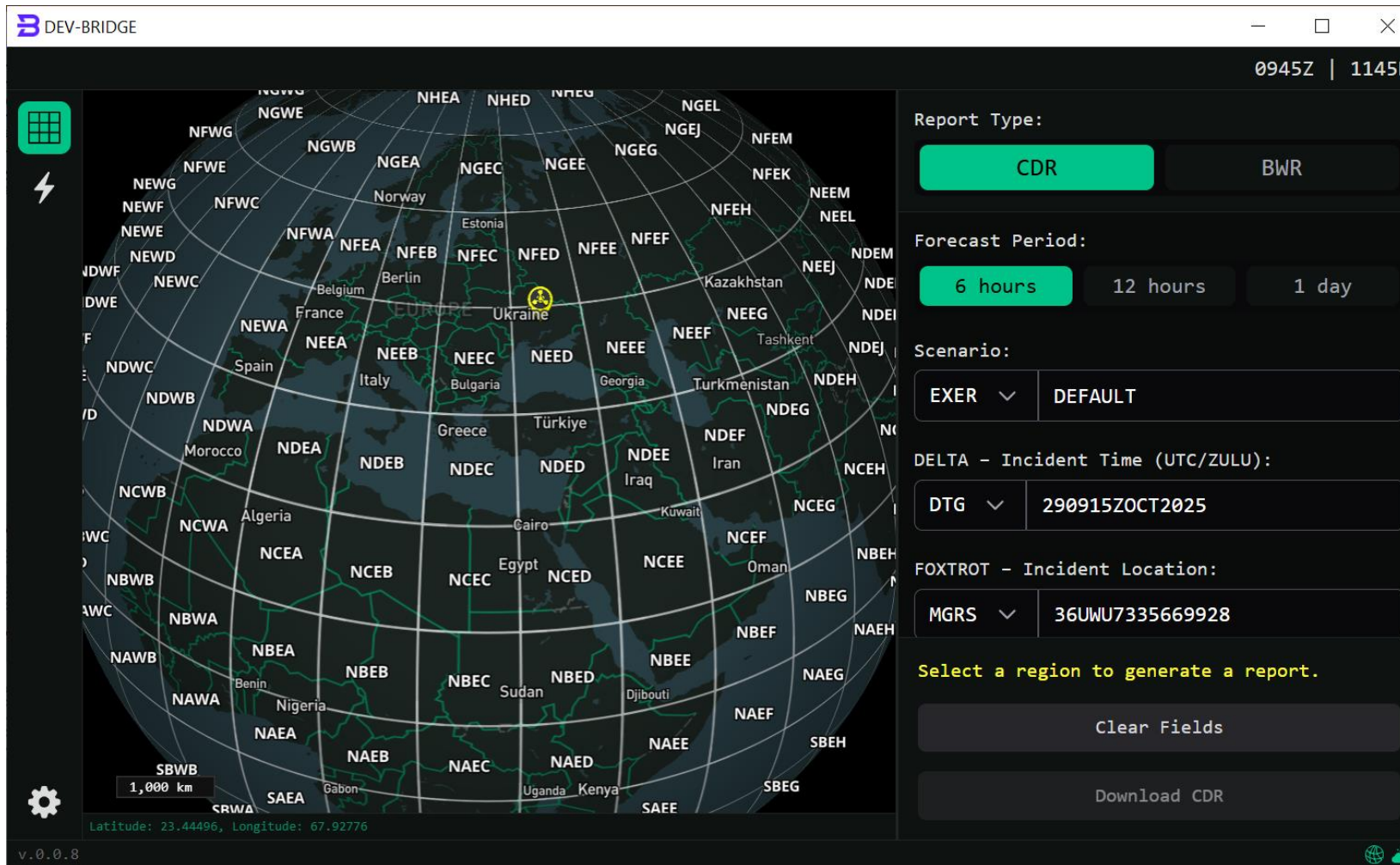


OPENMETEO is an aggregation MET service.

- 1) Automatically processes freely available MET data.
- 2) Can be accessed online by http request
- 3) Can be set up and run locally (for security/avoid DDOS)

III: SOLUTION IMPLEMENTATION

Bi-directional Reporting Intelligence Data Gateway Exchange - BRIDGE



BRIDGE is a Javascript utility developed to handle MET procurement.

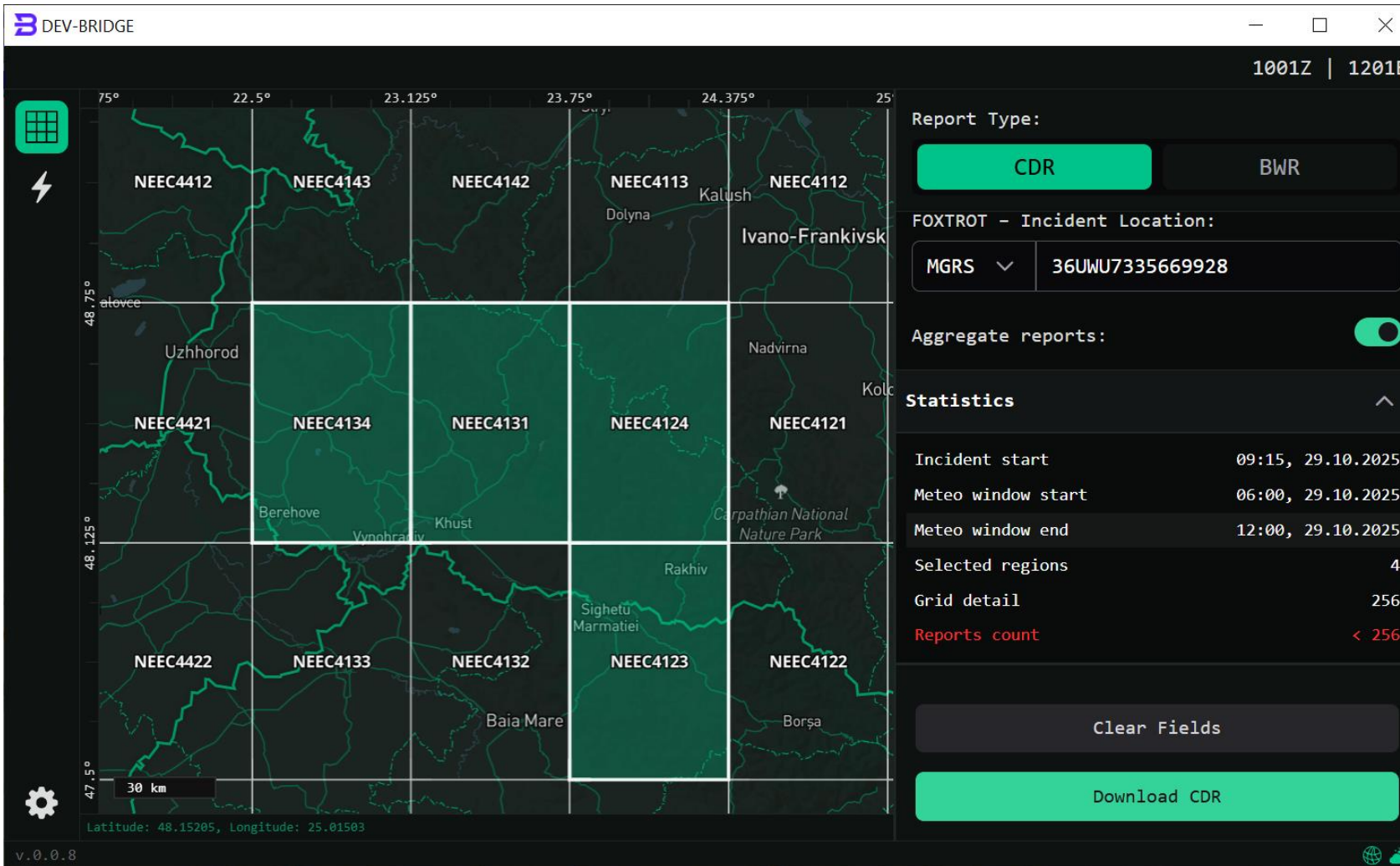
It works by making OpenMeteo or SFTP server requests for data, which it then processes to ATP-45 messages and uploads them to CBRN A (through designated LAN folder)

BRIDGE Features



Current Features:

- 1) Automatic MET downloading from OpenMeteo (online or local)
- 2) Automatic aggregation of MET data over similar regions
- 3) Manual region specification if needed



BRIDGE OUTPUT

File Explorer showing the directory structure for BRIDGE_D. The files are listed in a table with columns: Name, Date modified, Type, and Size.

Name	Date modified	Type	Size
1761658571734_CDR_1-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_2-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_3-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_4-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_5-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_6-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_7-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_8-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_9-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_10-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_11-23.lan	28/10/2025 15:36	LAN File	29 KB
1761658571734_CDR_12-23.lan	28/10/2025 15:36	LAN File	29 KB

Below the file list, a Notepad++ window displays the content of the file 1761658571734_CDR_1-23.lan. The text is a series of commands and parameters, including EXER/DEFAULT, MSGID/CBRN, GEODATUM, DTG, AREAM, ZULUM, UNITM, WHISKEYM, XRAYM, YANKEEM, and GENTEXT.

```
1 EXER/DEFAULT//15
2 MSGID/CBRN-CDR/APP-11(E)/1/CC/-/-/-/-/-//15
3 GEODATUM/-//15
4 DTG/281336Z0CT2025//15
5 AREAM/NEED4441111//15
6 ZULUM/281336Z0CT2025/280000Z0CT2025/280600Z0CT2025//15
7 UNITM/-/DGT/KPH/C//15
8 WHISKEYM/023/006/N/005/8/0/1//15
9 XRAYM/034/007/N/005/8/0/1//15
10 YANKEEM/036/008/N/005/8/0/2//15
11 GENTEXT/-//15
12 15
13 EXER/DEFAULT//15
14 MSGID/CBRN-CDR/APP-11(E)/1/CC/-/-/-/-/-//15
15 GEODATUM/-//15
16 DTG/281336Z0CT2025//15
17 AREAM/NEED4441111//15
18 ZULUM/281336Z0CT2025/280600Z0CT2025/281200Z0CT2025//15
19 UNITM/-/DGT/KPH/C//15
20 WHISKEYM/034/010/N/006/8/0/2//15
21 XRAYM/031/012/N/008/7/0/1//15
22 YANKEEM/041/013/N/010/6/0/1//15
23 GENTEXT/-//15
24 15
```

length: 28,798 |irLn: 1 |Col: 1 |Pos: 1 | Unix (LF) | UTF-8 | IN



CBRN-Analysis - DEFAULT - [WORKMAP]

File Map View Wizard Calculations Documentation Exercise Window Help

Calculate In: 0 - Out: 0 - NATO UNCLASSIFIED

Task Update EXER

MET area grid settings

- Enable MET area grid ☐
- Enable Halo ☒
- Valid Met area settings
- Valid MetArea ☐ Off ☒ CDR ☐ BWR
- Valid at 291000Z0CT2025

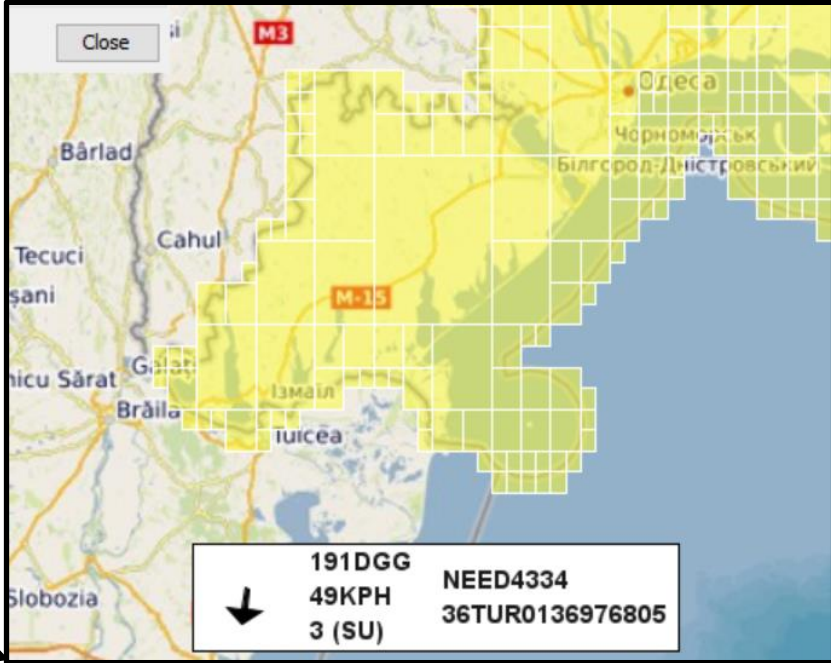
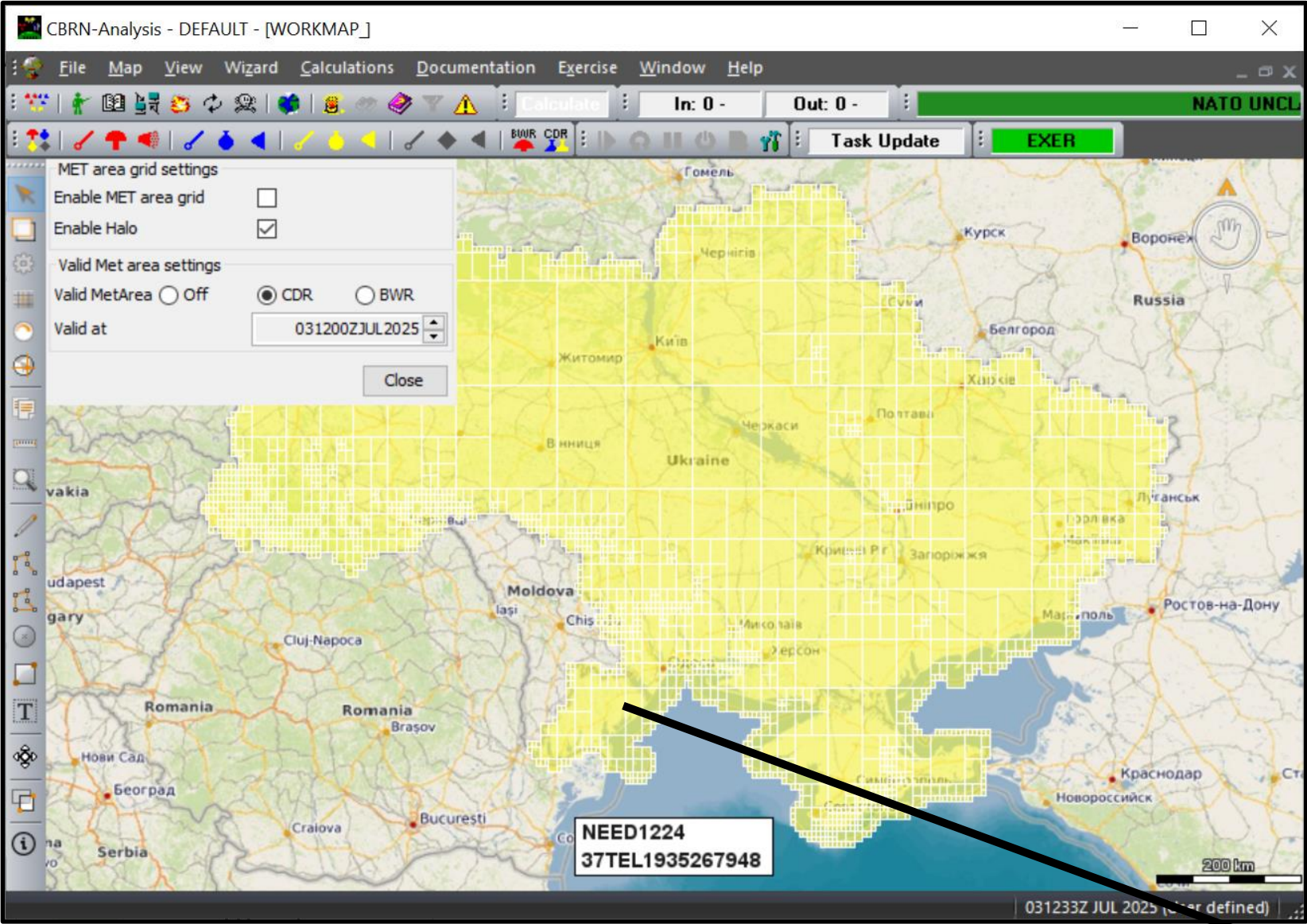
Close

Map showing a grid overlay on a geographical area. The grid is yellow and covers a region in Hungary and Ukraine. The map includes labels for locations such as Miskolc, Nyiregyháza, Satu Mare, Debrecen, Baia Mare, and Sighetu Marmatiei. A scale bar indicates 20 km.

NEEC4122
35ULP3962828599

291002Z OCT 2025 (System time)

BRIDGE AGGREGATION



BRIDGE BWR

DEV-BRIDGE

1248Z | 1448B

Report Type:

CDR BWR

Forecast Period:

6 hours 12 hours 1 day

Scenario:

EXER DEFAULT

DELTA - Incident Time (UTC/ZULU):

DTG 291246Z OCT 2025

FOXTROT - Incident Location:

MGRS 36UWU7335669928

Aggregate reports: ☒

Clear Fields

Download BWR

Latitude: 47.40386, Longitude: 39.57459

v.0.0.8

BRN-Analysis - DEFAULT - [WORKMAP]

File Map View Wizard Calculations Documentation Exercise Window Help

Calculate In: 0 - Out: 0 - NATO UNCL

Task Update EXER

NET area grid settings

able MET area grid ☐

able Halo ☒

alid Met area settings

alid MetArea ☐ Off ☐ CDR ☒ BWR

alid at 291200Z OCT 2025

Close

NEEE4243

38TLS3785652190

291249Z OCT 2025 (System time)

BRIDGE – PLANNED FEATURES

- 1) SFTP server connection – can already run through local OpenMeteo Server.
- 2) Other ATP-45 msg transmission.
- 3) Possible data downscaling using **diagnostic models**.

THANK YOU FOR YOUR ATTENTION!