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Using ICT to rapidly deploy Geospatial and Equipment Information Management systems for On-Site Inspections

Jonetta NG[1], Aled ROWLANDS[1], Elran BEN OR[1], Oleksandr SUKHOTSKY[2], Peter LABAK[1], Remi COLBALCHINI[1]

Comprehensive Nuclear Test-Ban Treaty Organisation (CTBTO) Preparatory Commission[1], Instrumental Software Technologies, Inc. (ISTI)[2]

CTBTO PREPARATORY COMMISSION | PUTTING AN END TO NUCLEAR EXPLOSIONS

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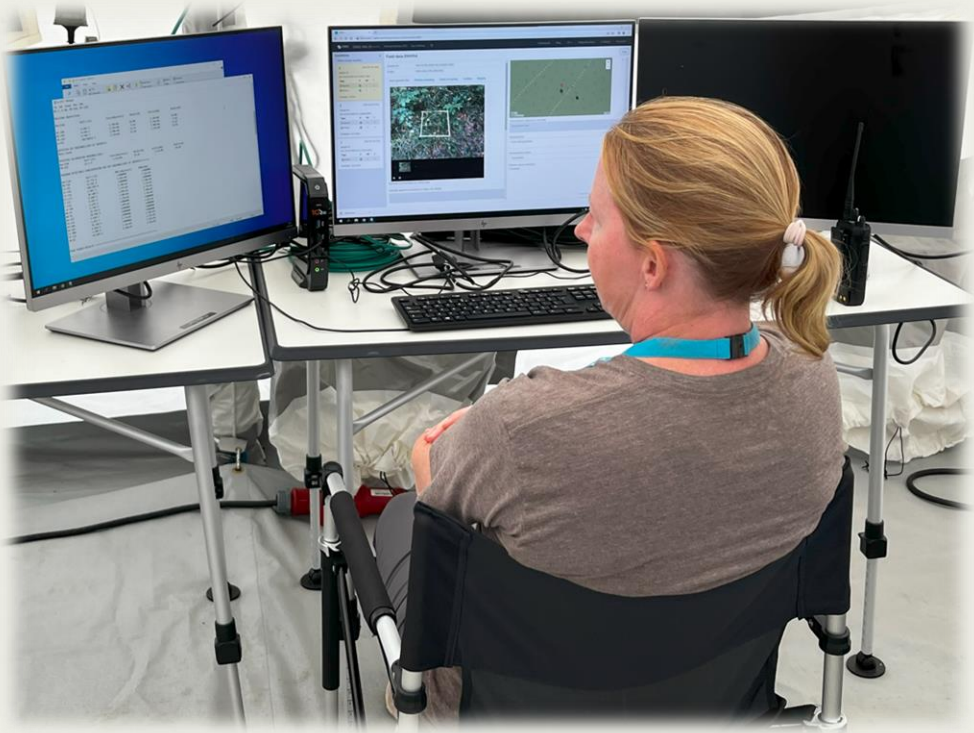
Constraint of Information and Communication Technology (ICT) during an On-Site Inspection (OSI)

OSI is limited to 40 inspectors

ICT equipment must be in a ready state:
- checked and ready to be deployed
- checked for no data from a different OSI

ICT equipment must be air-gapped and rugged under field environment conditions for use in the data management lifecycle:
- acquisition,
- maintenance,
- processing, and
- reporting



SnT 2025
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE

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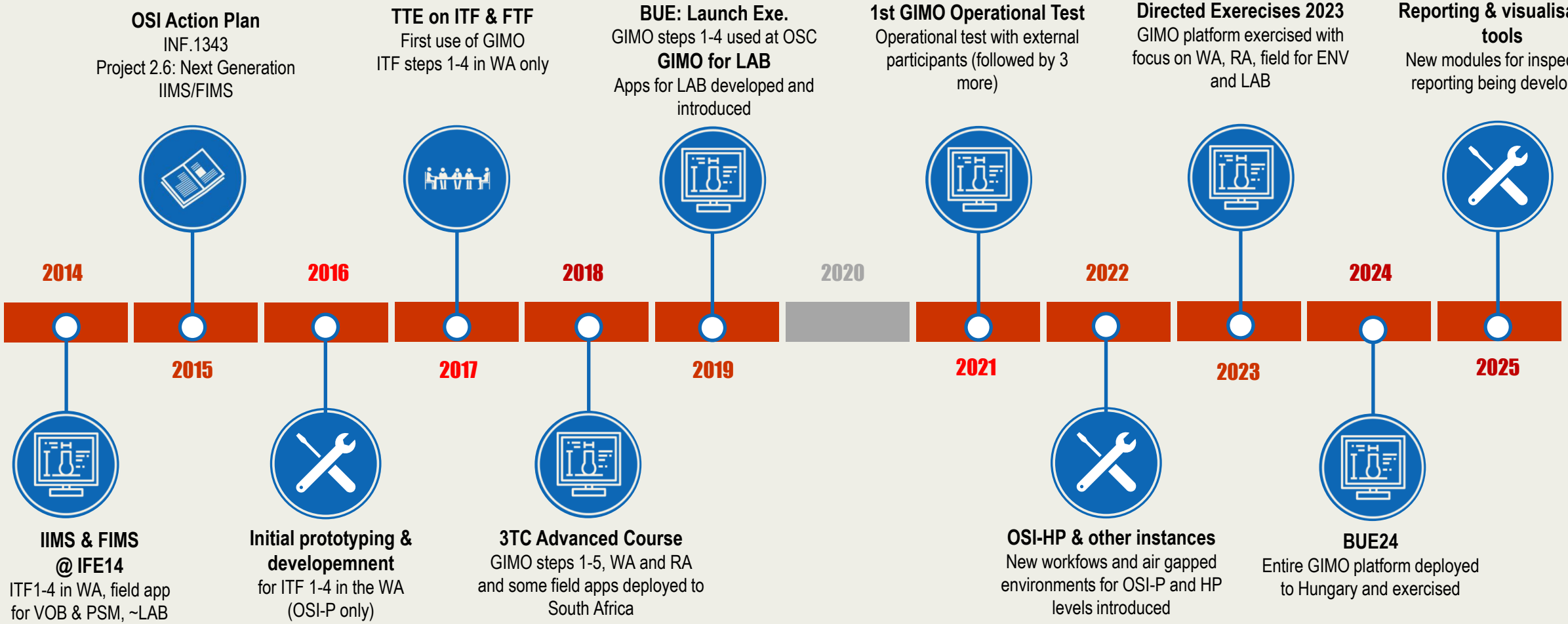
OSI Events and Milestones (with focus on ICT)



IIMS & FIMS @ IFE14
ITF1-4 in WA, field app for VOB & PSM, ~LAB

OSI Action Plan
INF.1343
Project 2.6: Next Generation IIMS/FIMS

Initial prototyping & developemnent
for ITF 1-4 in the WA (OSI-P only)

TTE on ITF & FTF
First use of GIMO
ITF steps 1-4 in WA only

3TC Advanced Course
GIMO steps 1-5, WA and RA and some field apps deployed to South Africa

BUE: Launch Exe.
GIMO steps 1-4 used at OSC

GIMO for LAB
Apps for LAB developed and introduced

1st GIMO Operational Test
Operational test with external participants (followed by 3 more)

OSI-HP & other instances
New workfows and air gapped environments for OSI-P and HP levels introduced

Directed Exerecises 2023
GIMO platform exercised with focus on WA, RA, field for ENV and LAB

BUE24
Entire GIMO platform deployed to Hungary and exercised

Reporting & visualisation tools
New modules for inspection reporting being developed

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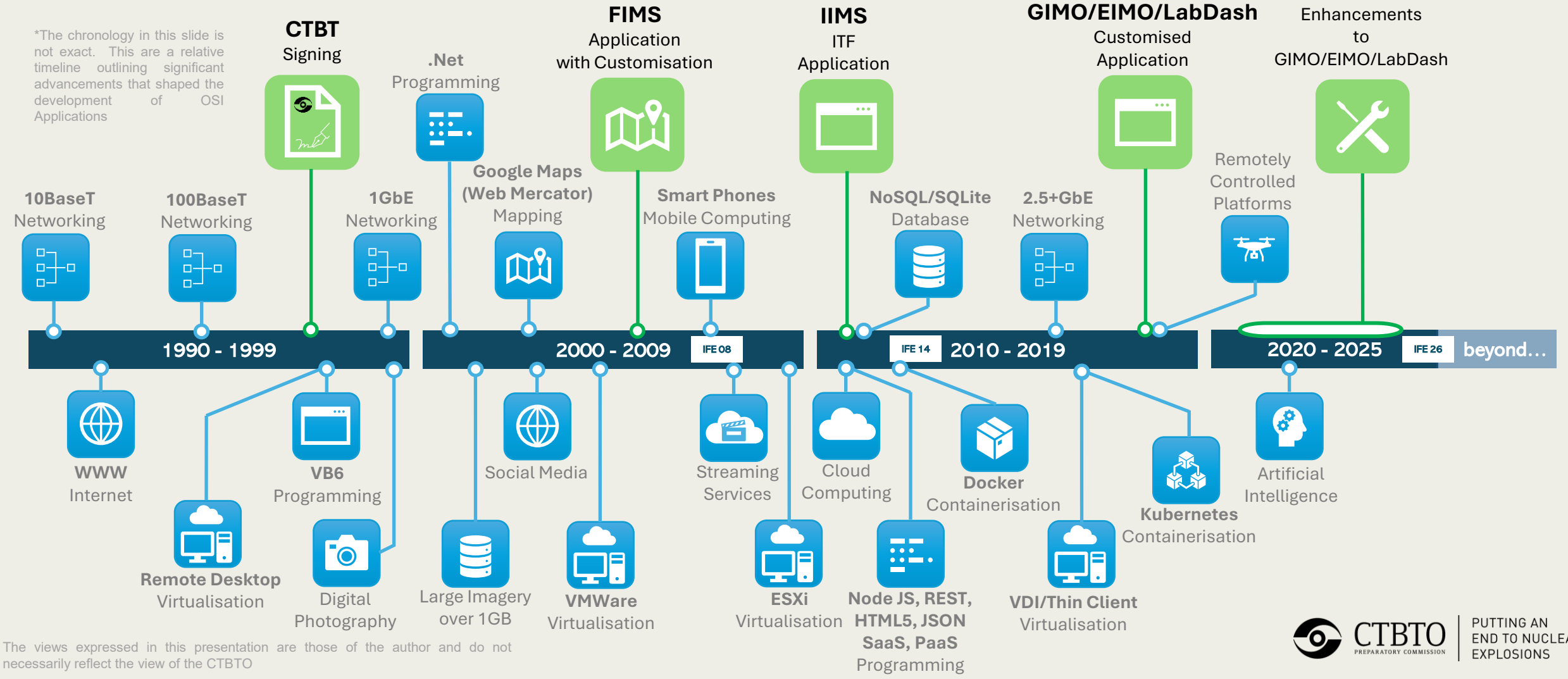
Evolution of ICT* and OSI Applications

*The chronology in this slide is not exact. This are a relative timeline outlining significant advancements that shaped the development of OSI Applications



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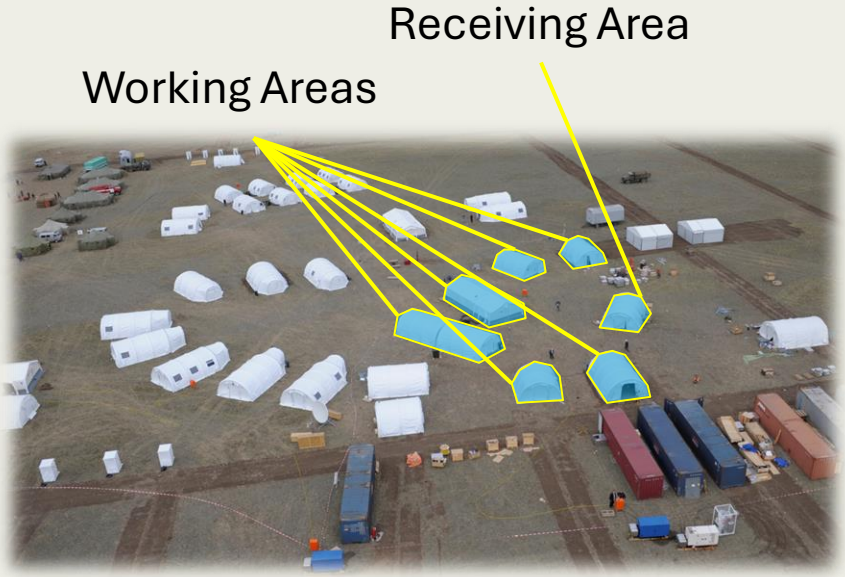
Infrastructure of Integrated Field Exercise (IFE) 2008

Field Information Management System (FIMS): an enhanced geospatial application on a rugged personal computer/laptop

- Inspectors divided into their technologies
- Individual applications installed on each rugged computer/laptop where data was processed
- Processed data ingested into FIMS to be provided to ITL
- No Inspection Team Functionality (ITF) at the time, concept was not yet available



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Infrastructure of Integrated Field Exercise (IFE) 2014

Integrated Information Management System (IIMS): custom Java application that implemented ITF

- More integration of technologies working together, reflected in the configuration of the working area
- Data were processed on individual rugged computers/laptops, but connected by network
- Data was provided to FIMS and connected to IIMS for report writing procedures
- Field forms were still completed on paper and scanned into IIMS-RA (except PSM and VOB, which had their own basic dedicated apps)

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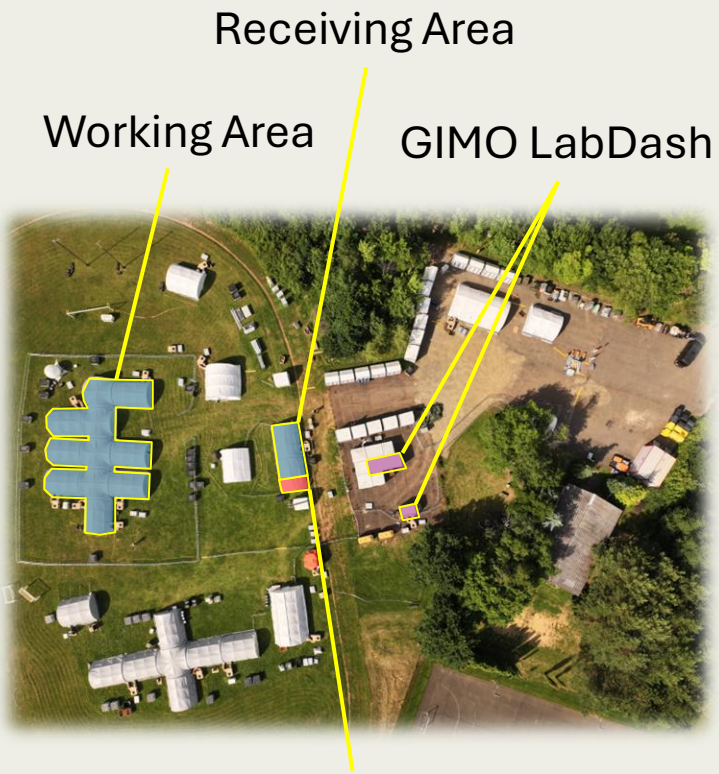
Current Infrastructure: Build-up Exercise 2024

Geospatial Information Management system for OSI (GIMO) integrated with Equipment and Instrumentation Management system for OSI (EIMO): web-based with multiple environments, working area, receiving area, lab and separated by Protected and Highly Protected classifications

- Integration with Operations Support Centre (OSC) providing Daily Plan updates for increased situational awareness
- Working area is composed of Zero Clients (VDI) and centralised data storage
- Virtualised and centralised Technical Expert applications



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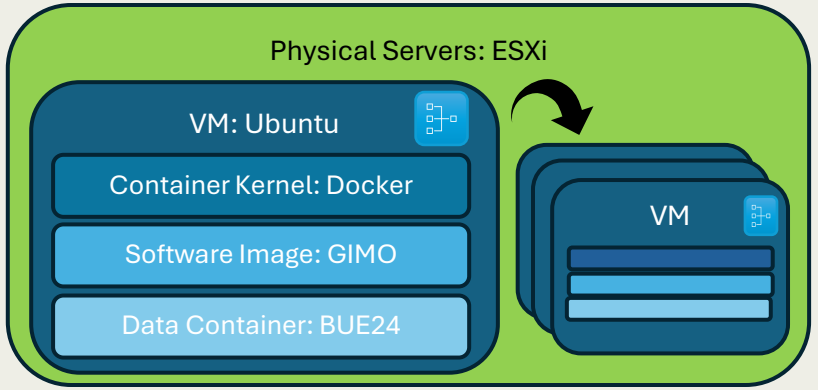
Architecture of the latest OSI applications

- Containerisation using Docker:
  - Decouples software/API versions from the operating system and data storage
  - Software image can be easily updated with latest image or rolled-back
  - Rapid deployment of empty instance for each exercise
- GIMO application can be duplicated multiple times, such as the Staging/test environment
- All data for an OSI is contained in a centralised storage structure
  - Access and security
  - Integrity of data
  - Simplicity of backup and archival
- The effort of maintaining the ICT is reduced, and allows more inspectors to be performing field tasks



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Architecture of the latest OSI applications: Drawbacks

- Different environments to manage
- Digital infrastructure is more complex
- Due to container running within the VM, VM resources (CPU, storage, memory) can run out
- Tedious to log into every VM to manage the services

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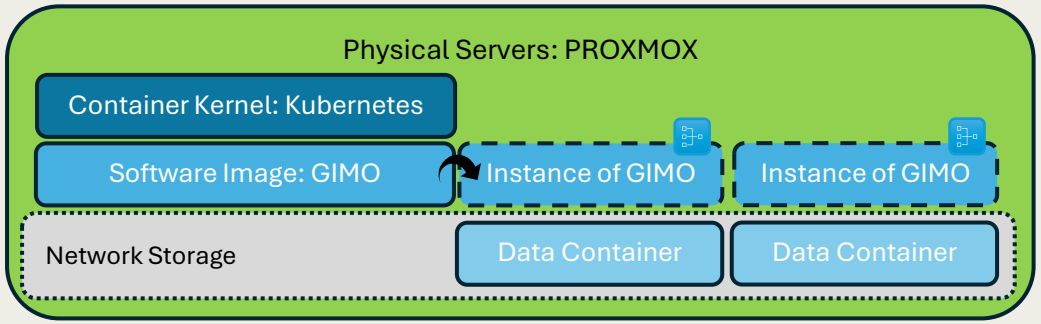
Future possible changes to OSI Applications

Implementing Artificial Intelligence: TTE or EM would be required, but is not a part of this discussion

Reorganising containerisation using Kubernetes

- Different architecture of centralised storage
- Easier archiving
- Faster rapid deployment capabilities
- Reduced overhead of VM



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Q&A