Data Farming Services (DFS) for Analysis and Simulation-Based Decision Support

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BLUF

Data Farming is a simulation-based methodology that **supports military decision-making** throughout the development, analysis, and refinement of Courses of Action. By performing many simulation runs, a huge variety of alternatives can be explored, analyzed and visualized to **allow decision makers improved situational awareness and to make more informed and robust decisions**.

Data Farming Services (DFS)

NATO Modelling and Simulation Group

NATO Modelling & Simulation
Task Group MSG-155

"Data Farming Services (DFS)
for Analysis and
Simulation-based Decision Support"

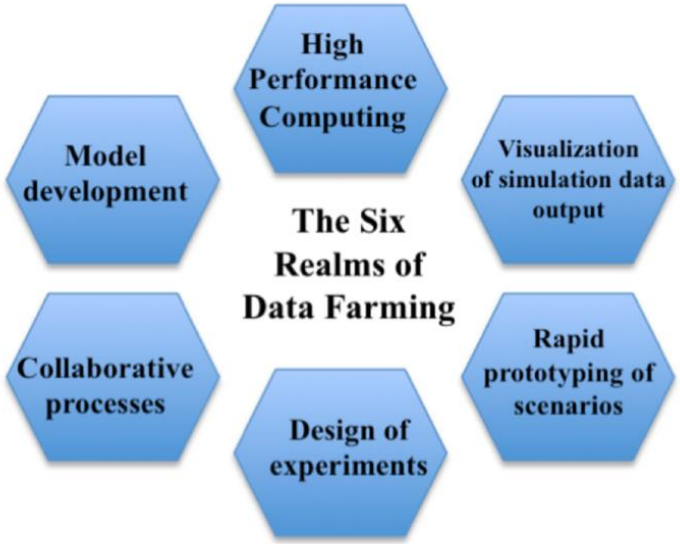
Mission Statement

DATA FARMING SERVICES
FOR ANALYSIS AND SIMULATION-BASED DECISION SUPPORT

“will allow NATO military decision makers in the domains of defence planning, operations, training and capability development to reduce uncertainty resulting in more robust solutions”

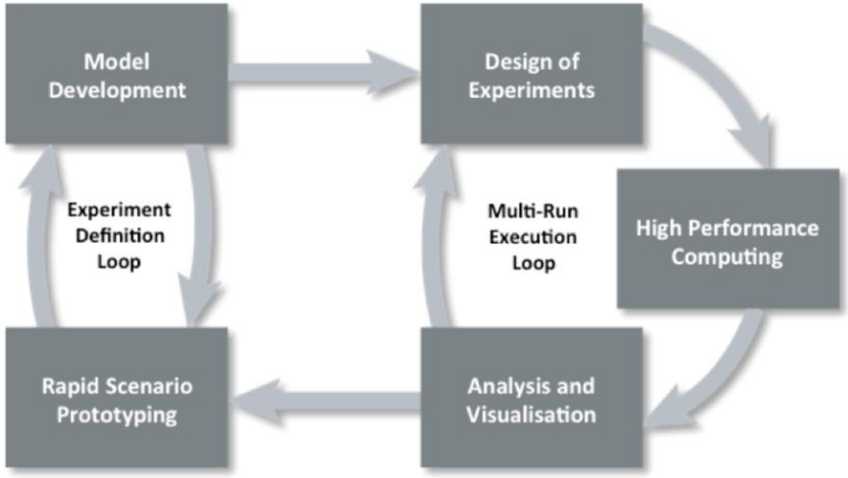
NATO Science and Technology Board, September 18th, 2018

Data Farming Concept – Six Realms



Data Farming

Loop of Loops



MSG-088 Data Farming in Support of NATO

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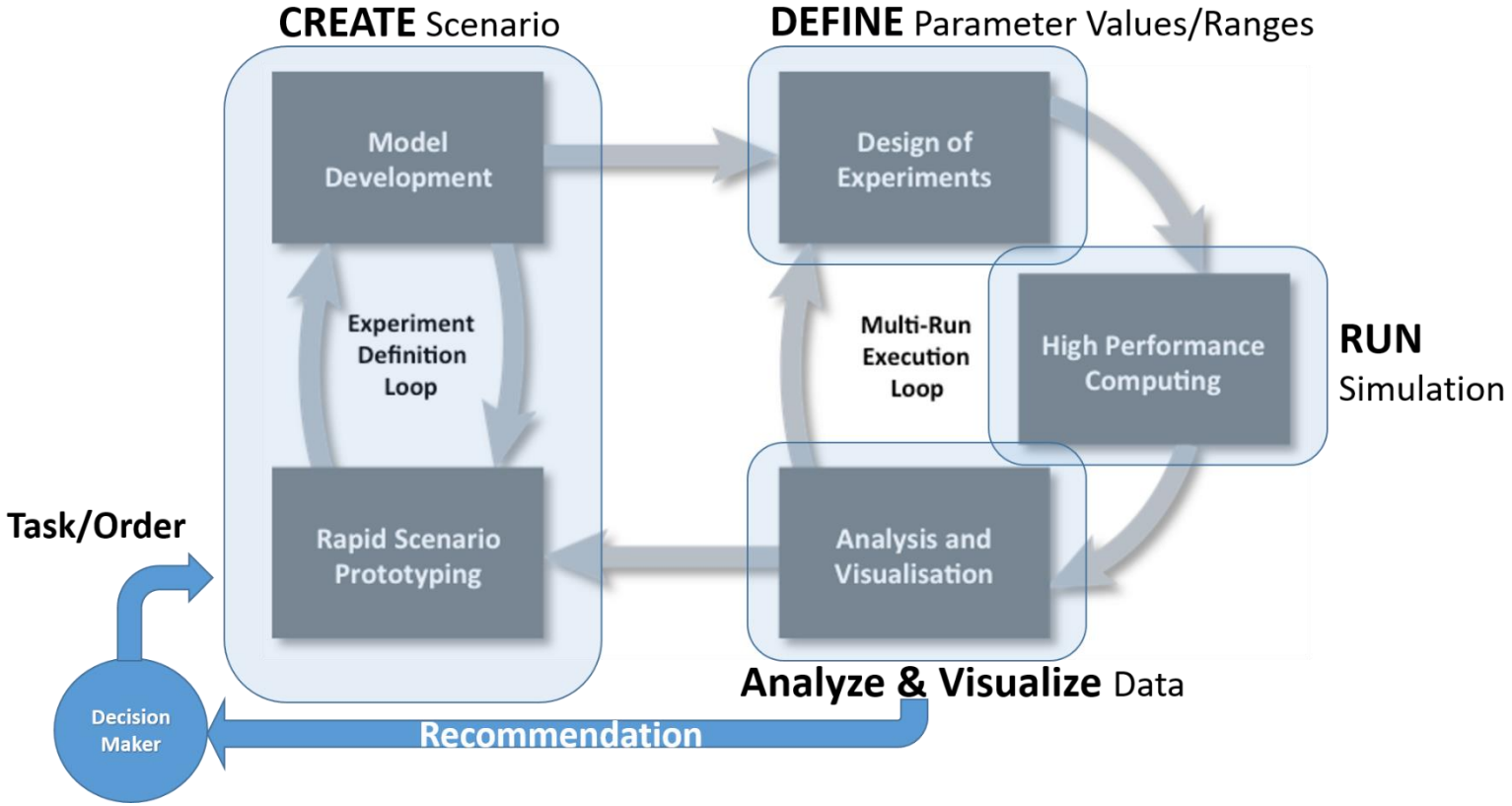
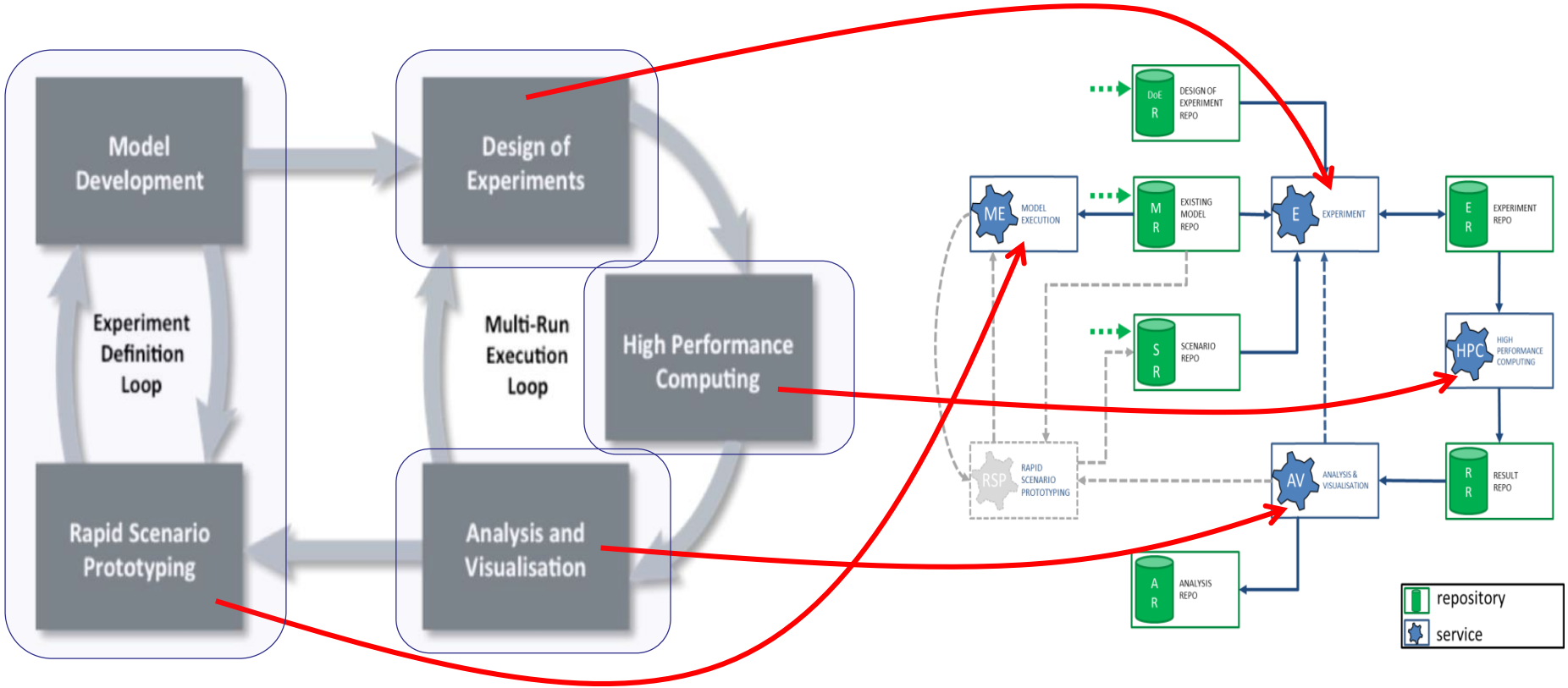
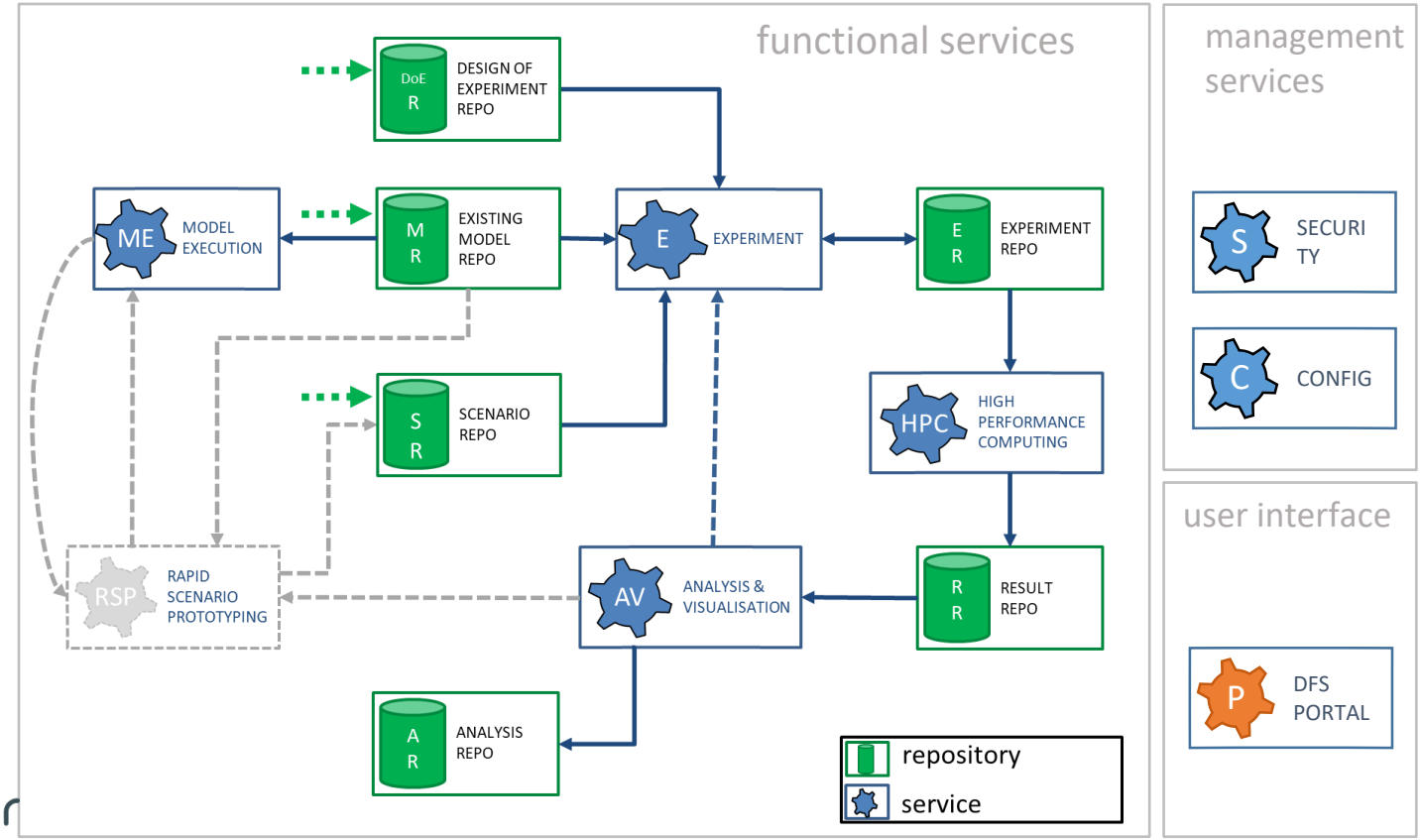
Data Farming - Process



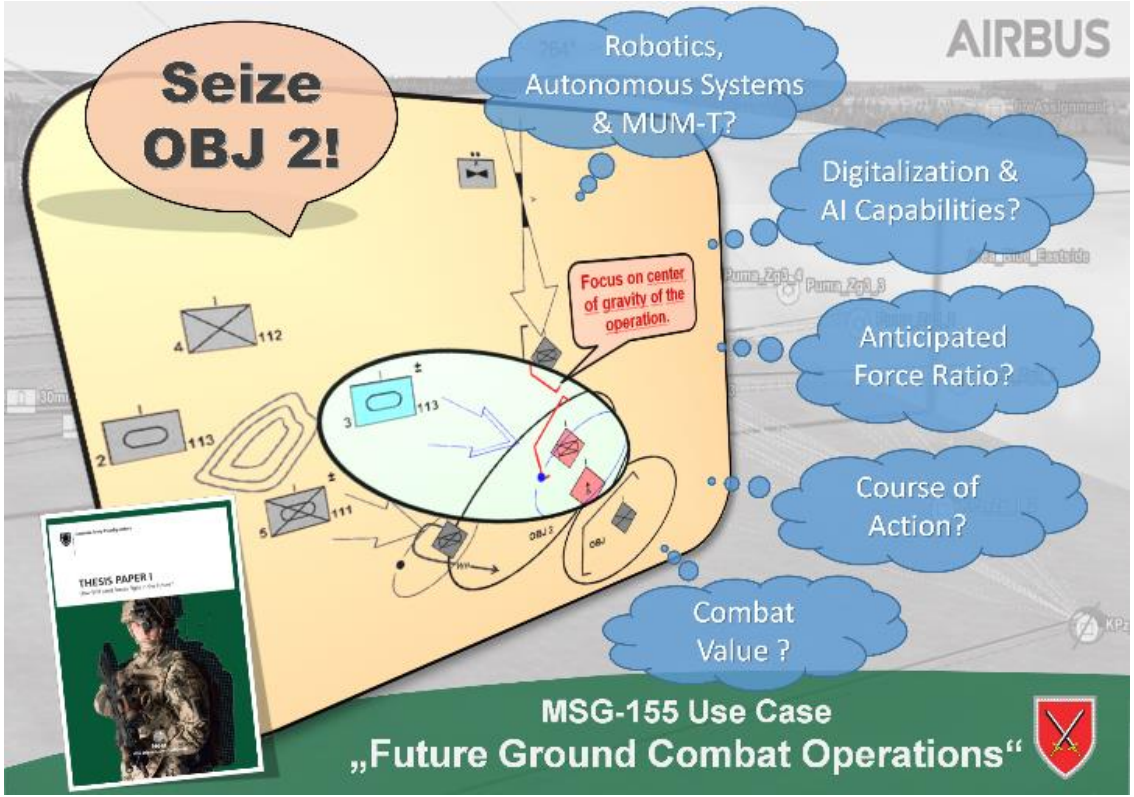
DFS – Implementation of the process



DFS Implementation – Web Services



MSG-155 Use Case “Future Ground Combat Operations”



Embedding simulation analysis capability into the decision making process on tactical level has been a long-term goal of the German Army for some time now.

This use case combines Course of Action analysis on battalion level with capability development by utilizing the data-farmable agent-based constructive simulation software *PAXSEM* (by AIRBUS) in the *DFS environment*.

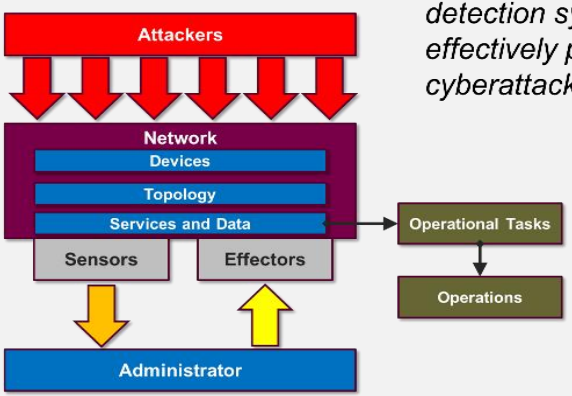
Evaluating well defined *Robotic and Autonomous Systems (RAS)* Capabilities and Manned-Unmanned Teaming (*MUM-T)* concepts with respect to their combat effectiveness lies within the center of this use case.

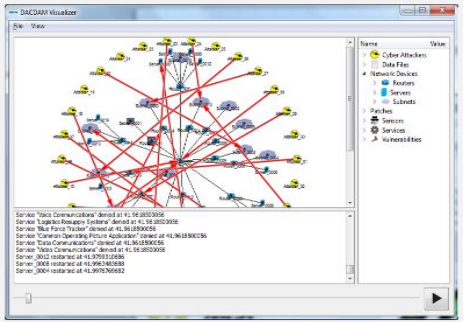
MSG-155 Use Case “Cyber Defence Operations”

MSG-155 Use Case: Optimal Placement of Sensors in a Computer Network

Question:

How should various network monitoring and detection systems be deployed in order to effectively protect critical services from cyberattacks?





D Data-farmable
A Agent-based
C Cyber
D Defence
A Assessment
M Model

Optimal Placement of Sensors in a Computer Network

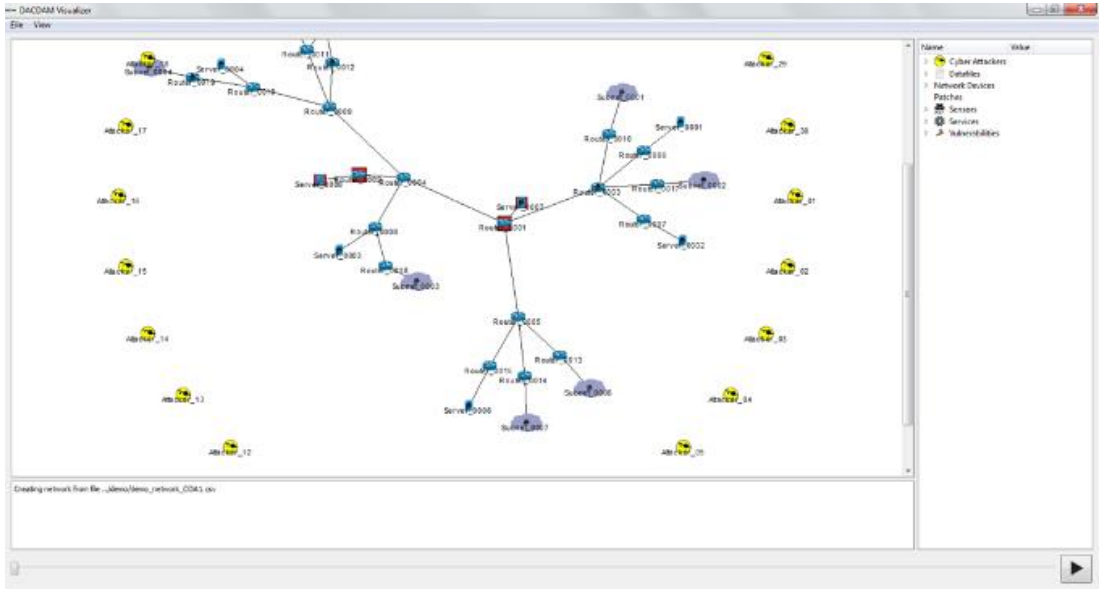
The decision-maker objective of this use case is to investigate how various network monitoring and detection systems should be deployed in order to effectively protect critical services from a wide range of malicious cyber activity.

The *Data-farmable Agent-based Cyber Defence Assessment Model* (DACDAM) was developed as an extensible proof-of-concept model in MSG-124 and has been developed further to support this use case.

DFS Demonstration

Situation

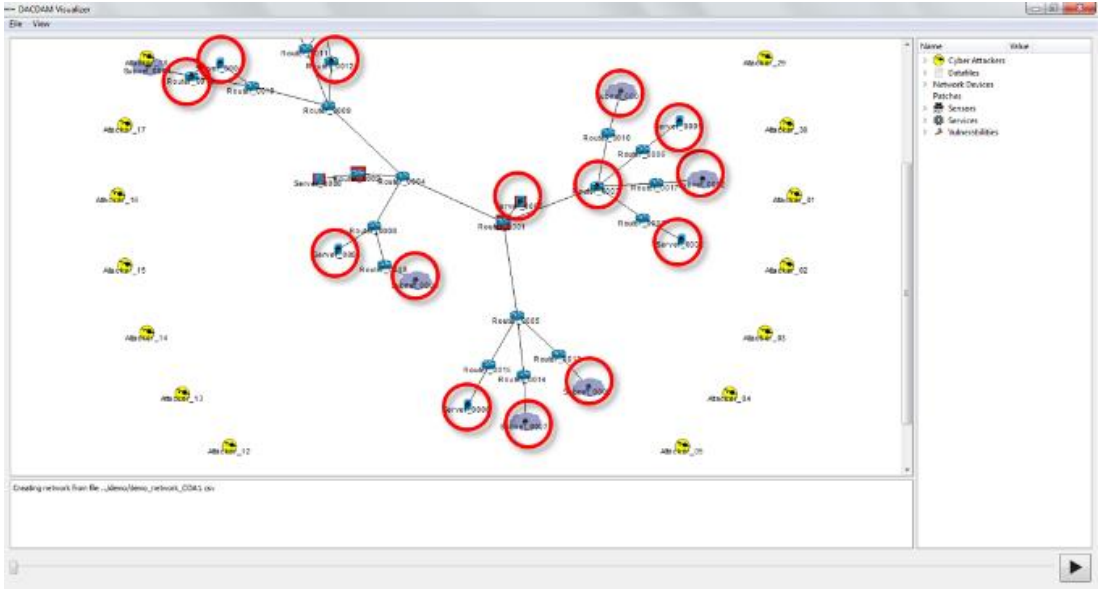
Mission Network subject to Cyber Attacks.



DFS Demonstration

Mission

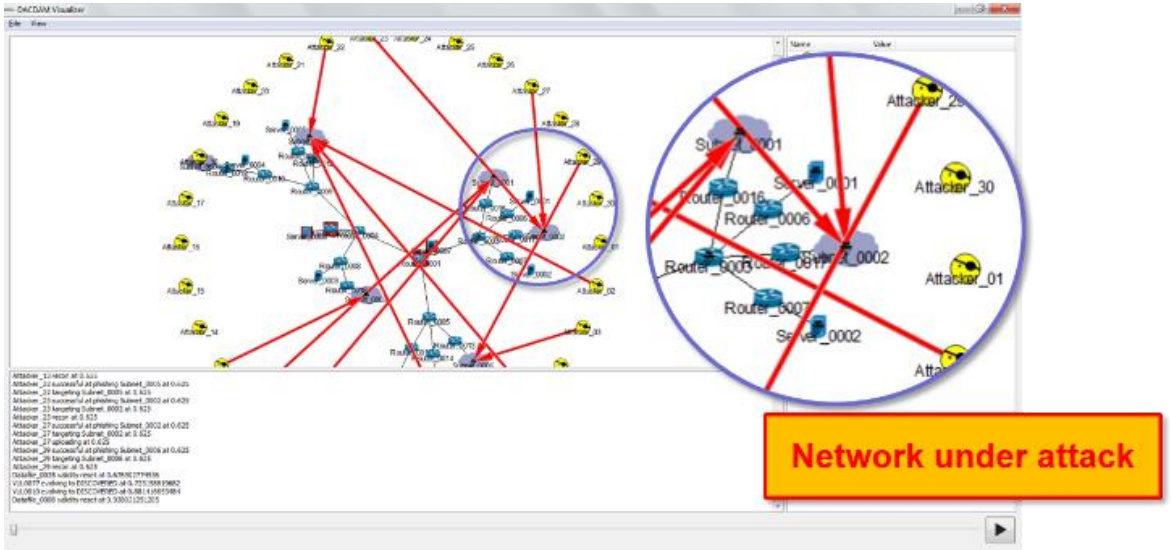
Deploy various network monitoring and detection systems in order to effectively protect critical services from cyberattacks.



DFS Demonstration

Cyber Attack

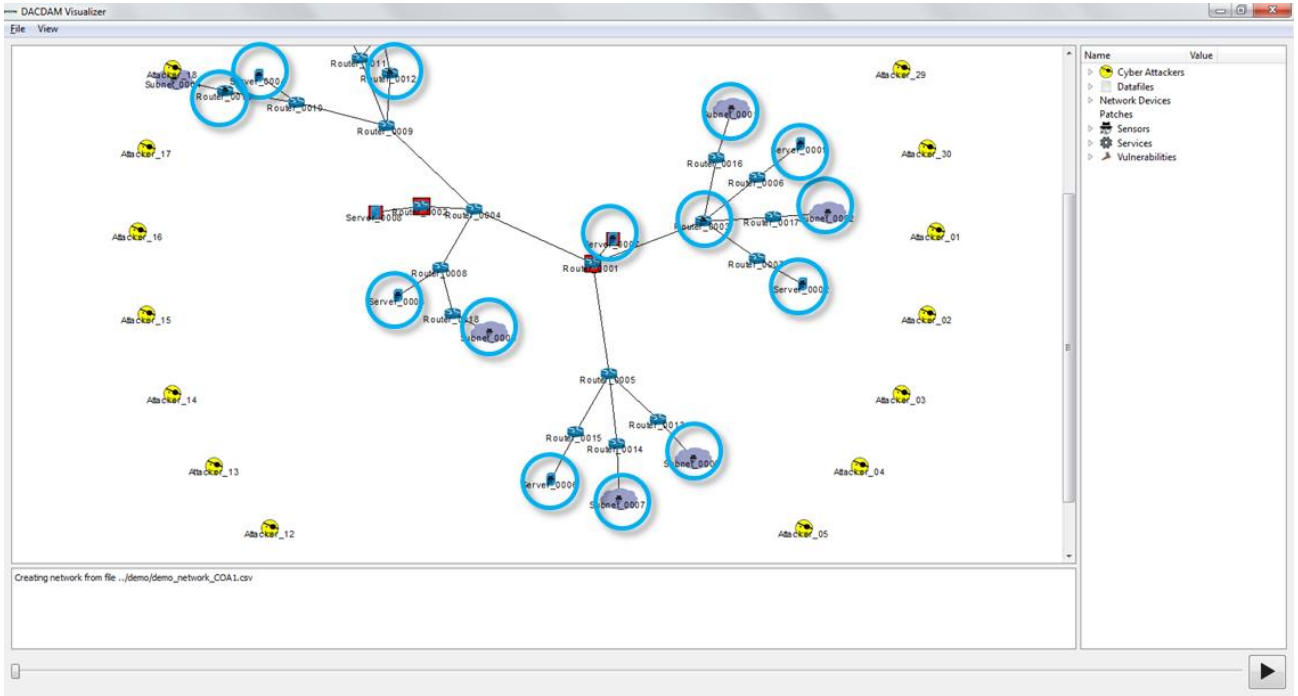
Cyber attackers launch single or multiple attacks on network nodes in order to achieve local or network shutdowns.



DFS Demonstration

Course of Action 1

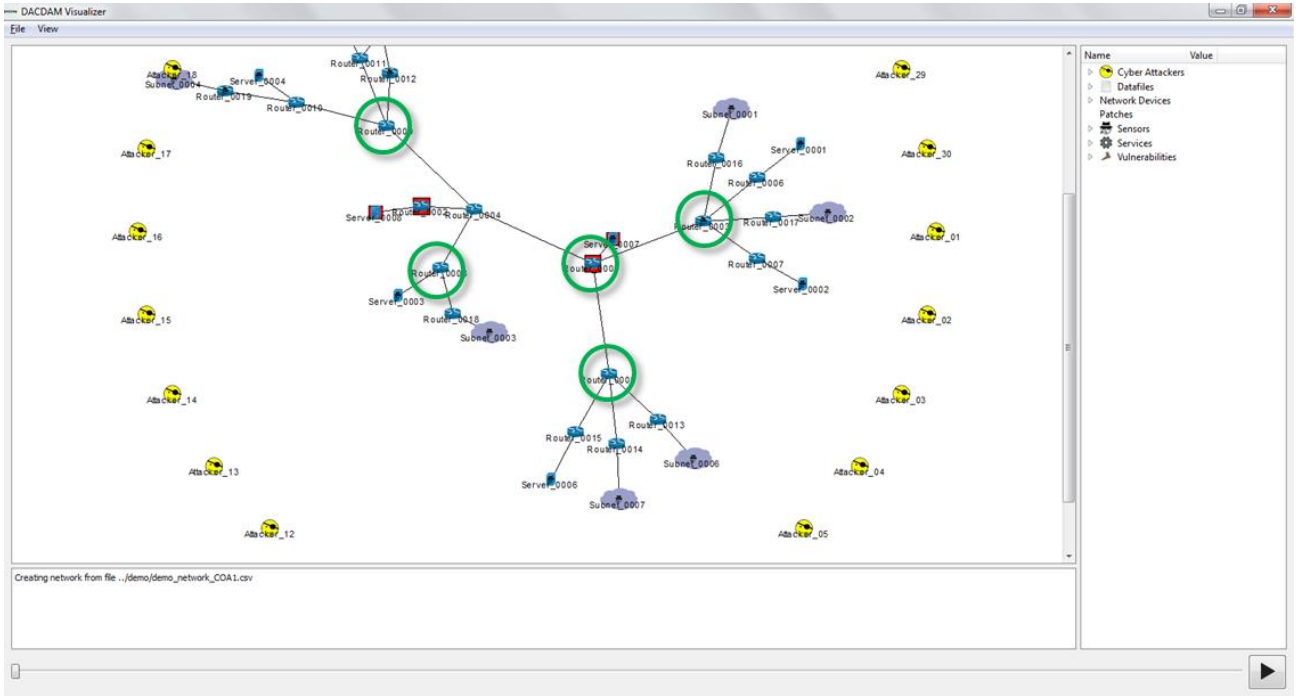
- Sensors evenly distributed over the entire network.



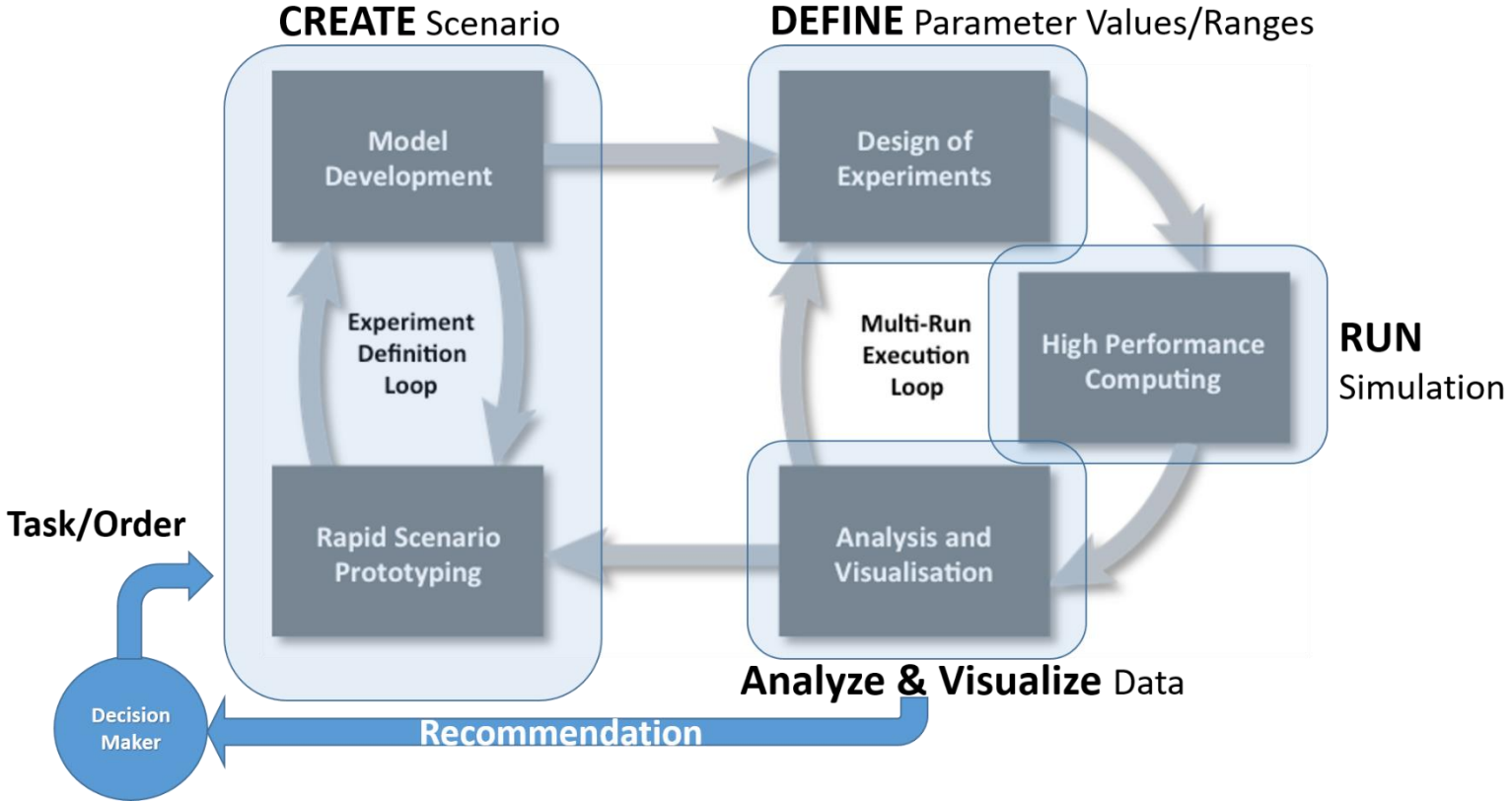
DFS Demonstration

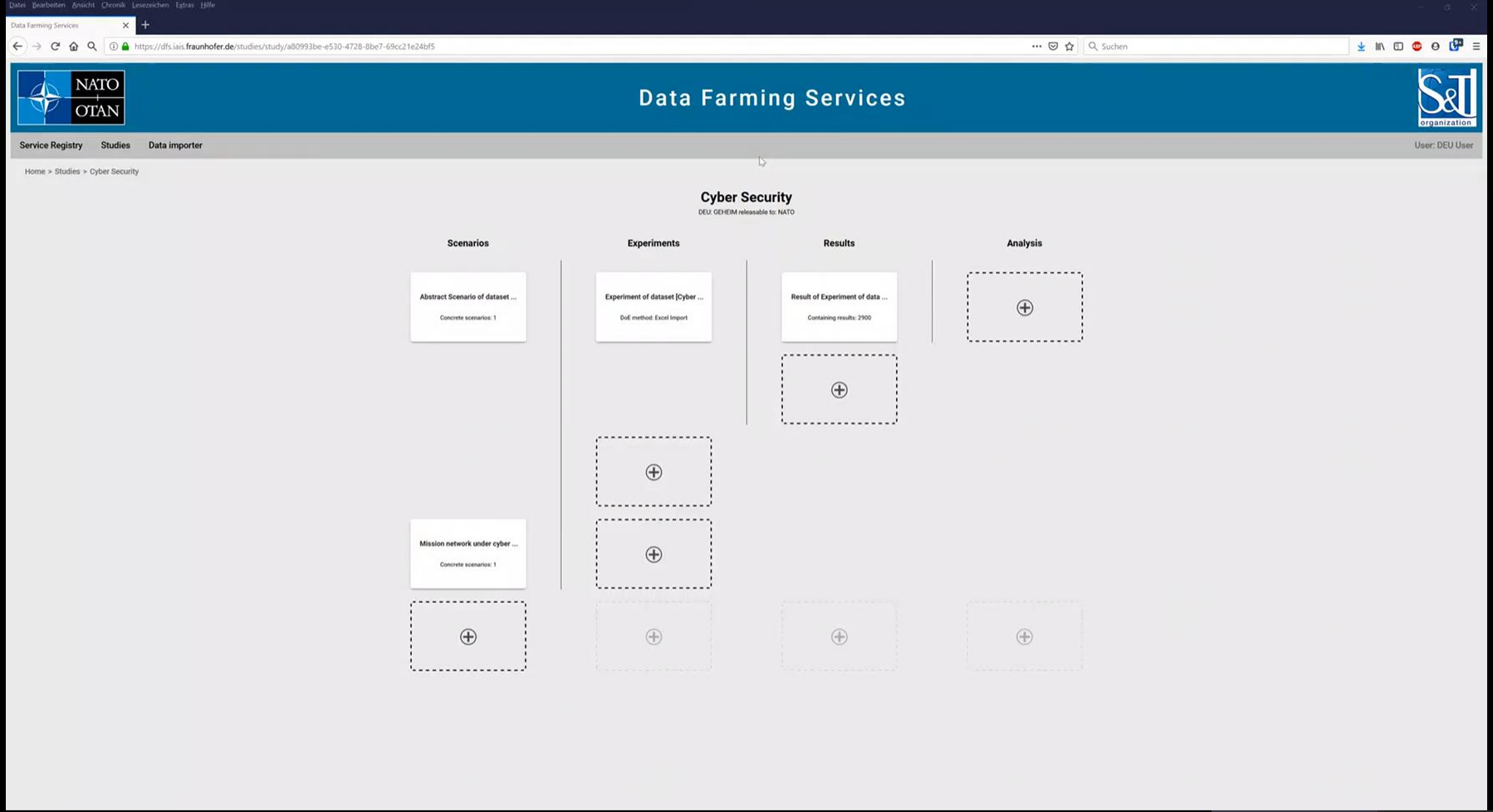
Course of Action 2

- Only most valuable network nodes are instrumented.



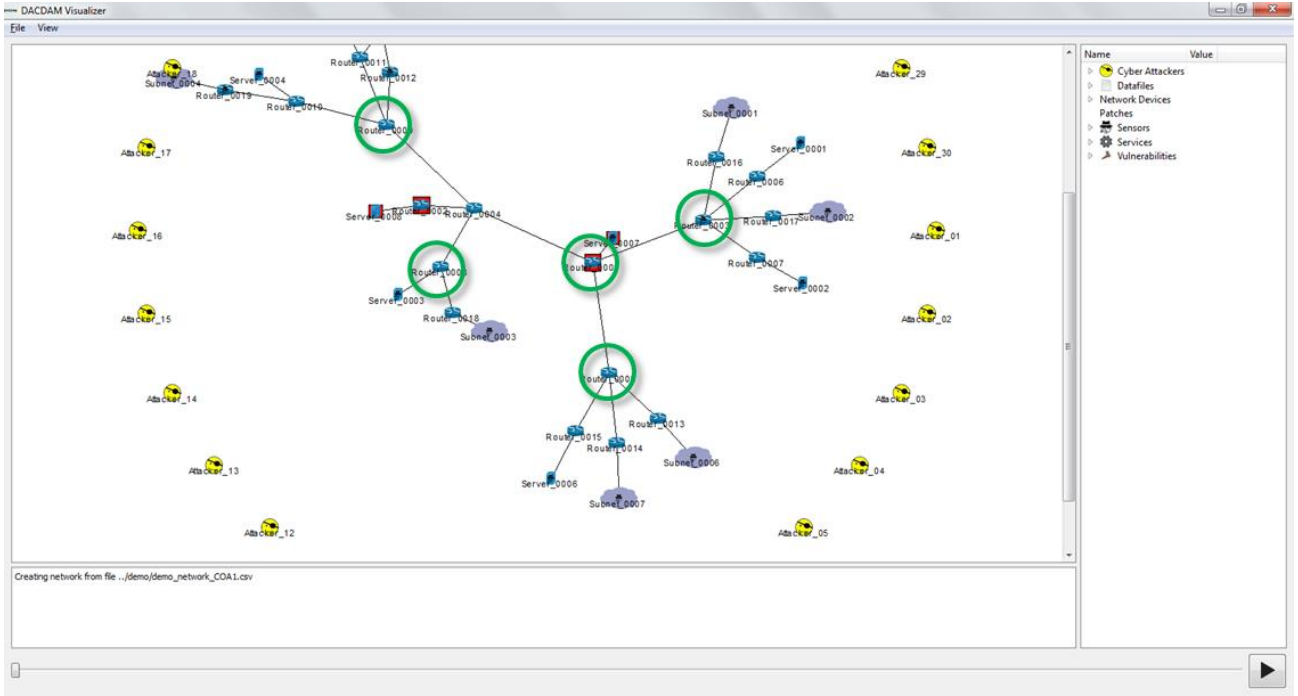
Recall


CREATE Scenario
DEFINE Parameter Values/Ranges
Model Development
Design of Experiments
Experiment Definition Loop
Multi-Run Execution Loop
High Performance Computing
RUN
Simulation
Task/Order
Rapid Scenario Prototyping
Analysis and Visualisation
Analyze & Visualize Data
Decision Maker
Recommendation


Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe
Data Farming Services
https://dfs.iais.fraunhofer.de/studies/study/a80993be-e530-4728-8be7-69cc21e24bf5
Suchen
NATO OTAN
Data Farming Services
S&T organization
Service Registry
Studies
Data importer
User: DEU User
Home > Studies > Cyber Security
Cyber Security
DEU: GEHEIM releasable to: NATO
Scenarios
Experiments
Results
Analysis
Abstract Scenario of dataset ...
Concrete scenarios: 1
Experiment of dataset [Cyber ...
DoE method: Excel Import
Result of Experiment of data ...
Containing results: 2900
Mission network under cyber ...
Concrete scenarios: 1
LtCol Seichter (Gast)
Richter, Marvin

DFS Demonstration

Refined CoA 2



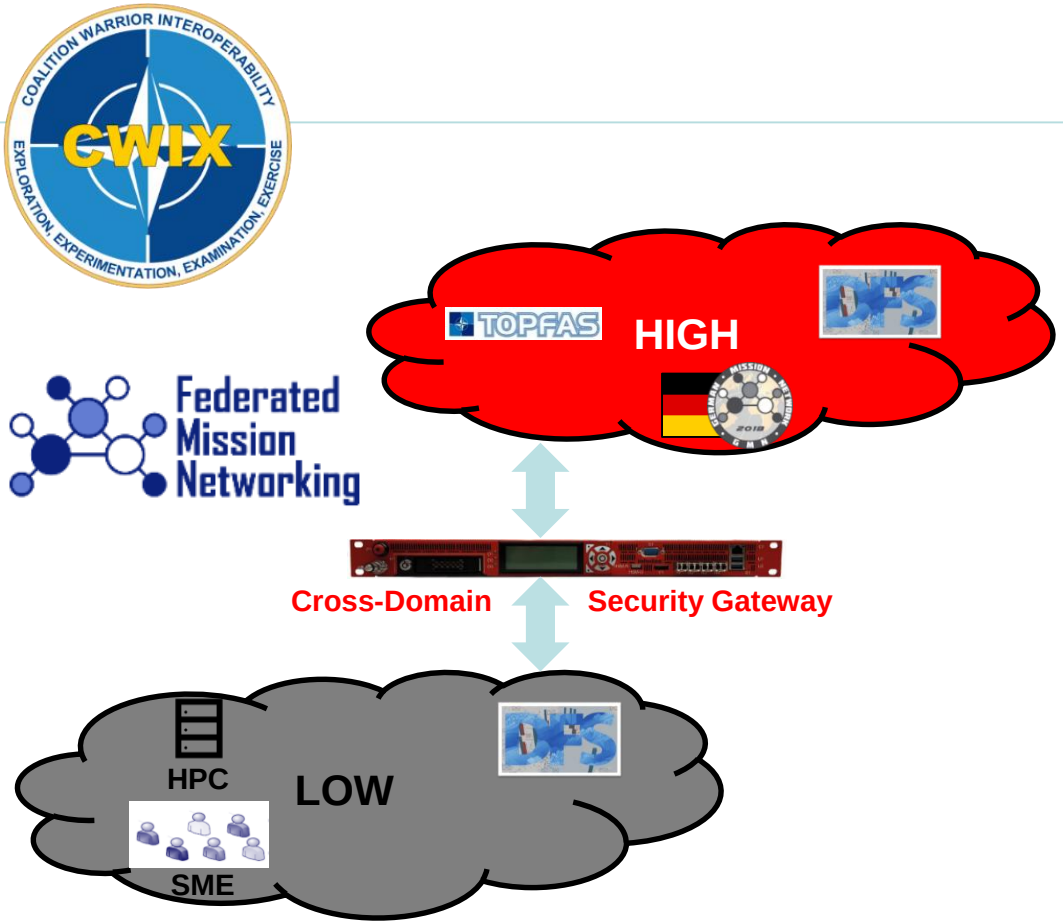
DFS Demonstration

Decision Brief

Deploy high-performance sensors on crucial network nodes in order to prevent network shutdowns.

DFS @ CWIX

- **Operational Use Cases *Predictive Maintainance* & *Future Ground Combat Ops***
- **IT services (Microservices)**
- **Distribute Services and Data where needed**
- **Connect Ressources even between networks with different classifications**
- **Support NATO Planning Tools in use, e.g.** TOPFAS
- **FMN compliant (Deployed on German Mission Network)**



CWIX Results – DFS Benefits

Technical Perspective

- Cloud based deployment & configuration
- Easy simultaneous automated update
- Distributable, flexible and scalable services based on Container technology, e.g. DOCKER
- Multi user, multi location, multi device applications

Operational Perspective

- Reachback to high value ressources, e.g. computing power and SME
- Cross Security Domain collaboration
- Federated Decision Support
- Speeds up Decision-Making Process

➢ **Network Resilience & Efficiency**

➢ **Faster Big Picture & Decisions**

CWIX 2020 – Conclusion

Modern microservice architectures maximize efficiency, security and interoperability resulting in enhanced situational awareness and improved decision making

NATO HQ SACT CWIX 2020 Closing DFS Evaluation:

“The kind of decision support provided by Data Farming Services to military commanders will be essential in tomorrow’s high-tech conflicts.”

(https://www.act.nato.int/articles/cwix-improving-interoperability-for-22-nations-across-10-times-zones)

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