Data Farming Decision Support for Operation Planning

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Introduction

- Modelling and Simulation (M&S) have successfully been applied for analysis in operational studies

- One area of great potential: direct support of military commanders and staff for operation planning

Introduction

- Using M&S for decision support in direct support of military commanders, we must align the support with the NATO Comprehensive Operations Planning Directive (COPD v2.0)

- Assessing the COPD at the Joint Head Quarter (JHQ) level we find that Phase 3b to develop, analyse, compare and refine Courses of Action (COA) will benefit from data farming

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Introduction

- A Data Farming Decision Support Tool for Operation Planning (DFTOP) was developed within the NATO task group Developing Actionable Data Farming Decision Support for NATO (MSG-124)

- It supports the Joint Operations Planning Group (JOPG) in operation planning

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Introduction

- To provide decision support for a commander, DFTOP perform three sub-processes:

1. automates statistical analysis in data farming

2. focus on the big picture of how to win in military combat

3. focus on specific questions of when we will win in different specific situations

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Introduction

- To demonstrate our concept, we use a large-scale symmetric scenario in which a country Bogaland is attacked

- The task is to develop an operation plan to defend Bogaland

- The scenario represents a realistic situation for JHQ

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Alignment of DFTOP to COPD

- At the operational level, planning seeks to transform a strategic direction into a series of military actions:

1. A review of the situation, and what must be accomplished

2. Focus on determining how operations should be arranged within an overall operational design

3. The operational design provides the basis for development of the operational concept and the plan

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Alignment of DFTOP to COPD

- In the Operational Estimate (Phase 3) focus for JOPG is to identify what has to be done under which conditions and limitations for mission success, and how it should be done

- In COA Development (Sub-phase 3b) it is determined how to best carry out operations

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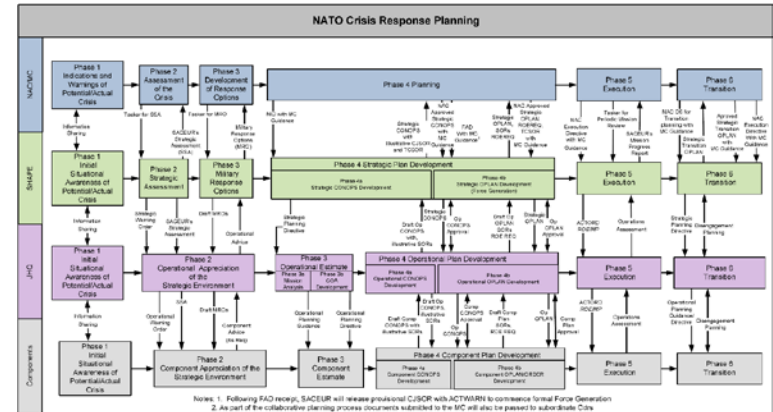
# Alignment of DFTOP to COPD
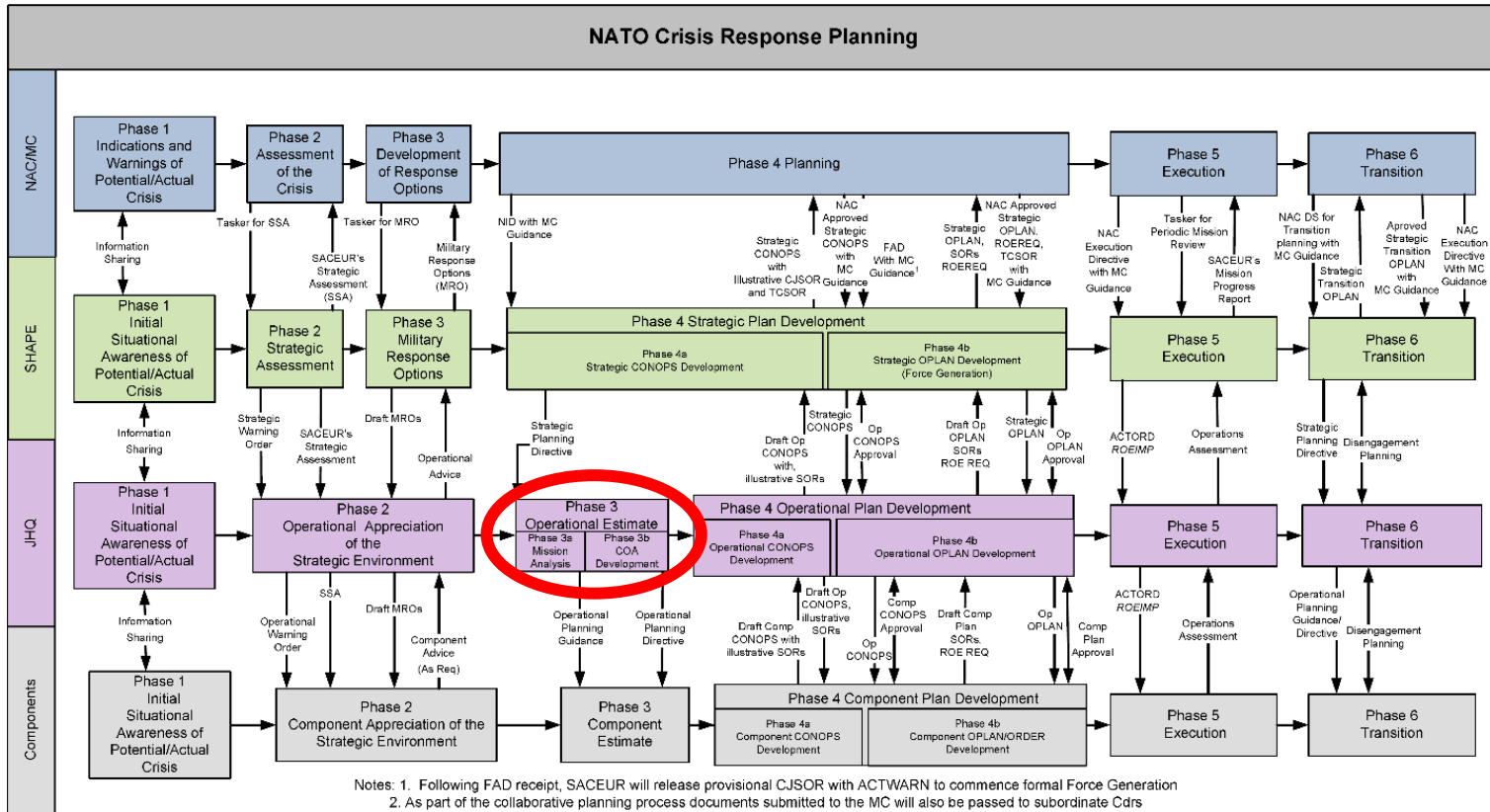
Alignment of DFTOP to COPD

- DFTOP translate statistical data into actionable information in support of decision making:
  - opposition and own COA in relation to the achieved effects
  - the most important factors
  - enables decision makers to understand results quickly
  - provide efficient arguments for decisions
  - evaluate risks and find plausible outcomes

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DFTOP Concept

- DFTOP is intended as a tool for operational analysts

- The analyst prepares analysis and visualisation based on simulation output

- The decision maker is confronted with visualisations and limited user-interaction

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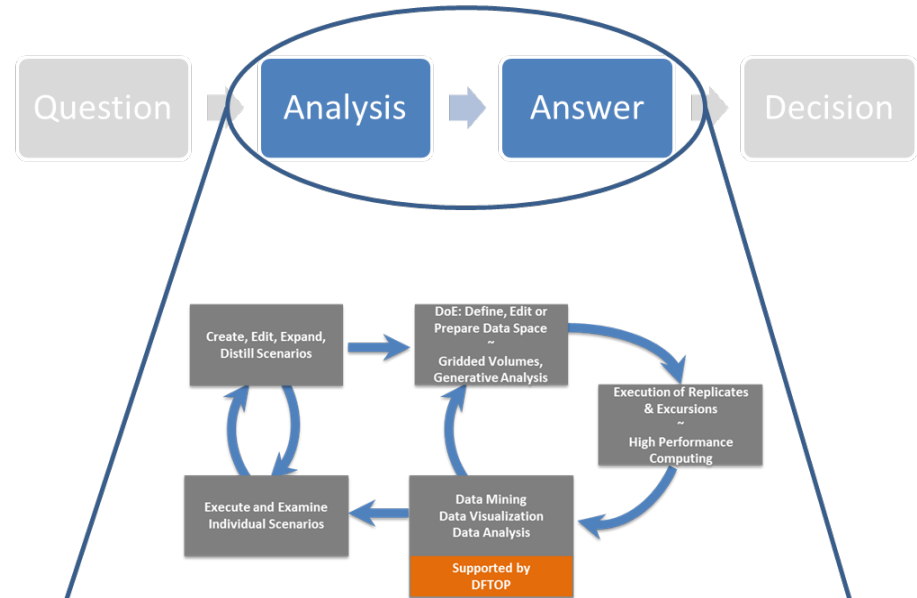
DFTOP Concept vs. Data Farming

- DFTOP takes the output of HPC:

1. terminates the loop
2. additional analysis
3. refine the DOE

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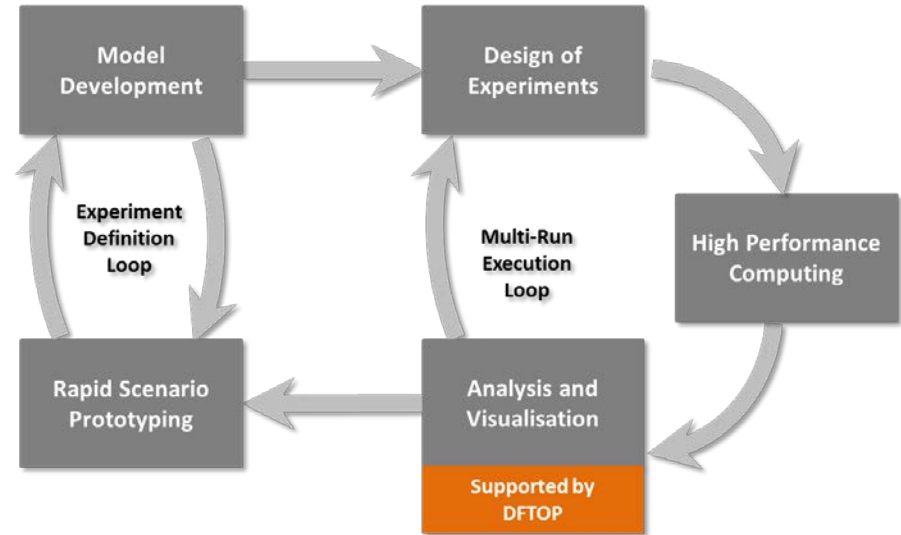
DFTOP Concept

- Question from COPD Mission Analysis

1. **answers** based on hard facts in the COA Development

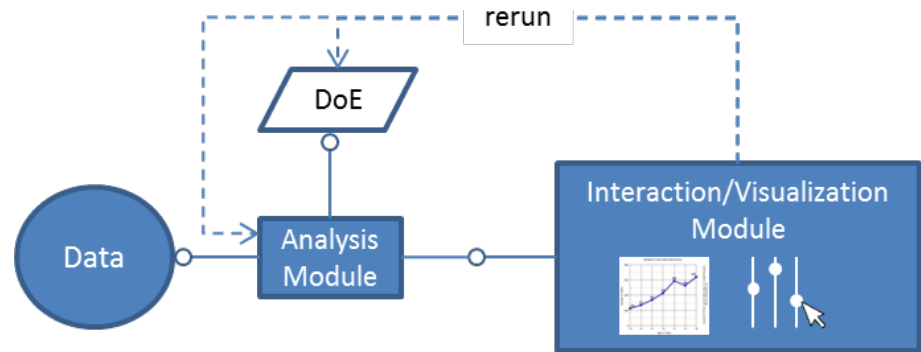2. supports analysis and **provides answers in a structured way**

DFTOP Concept

- There are three ways of interacting
1. data can be analysed,
2. the results can be visualised
3. the analysis can be influenced by the user
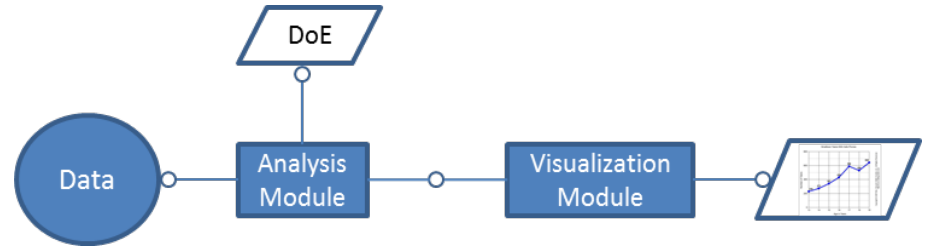
DFTOP Concept

- The module is a two-way-interaction module

- Allows the user to display results and interact by filtering and scaling

DFTOP Concept

- Results from COA Development are presented to the commander in a decision brief

1. Most important analysis into one visualisation

2. This merges several analysis modules into a single Dashboard

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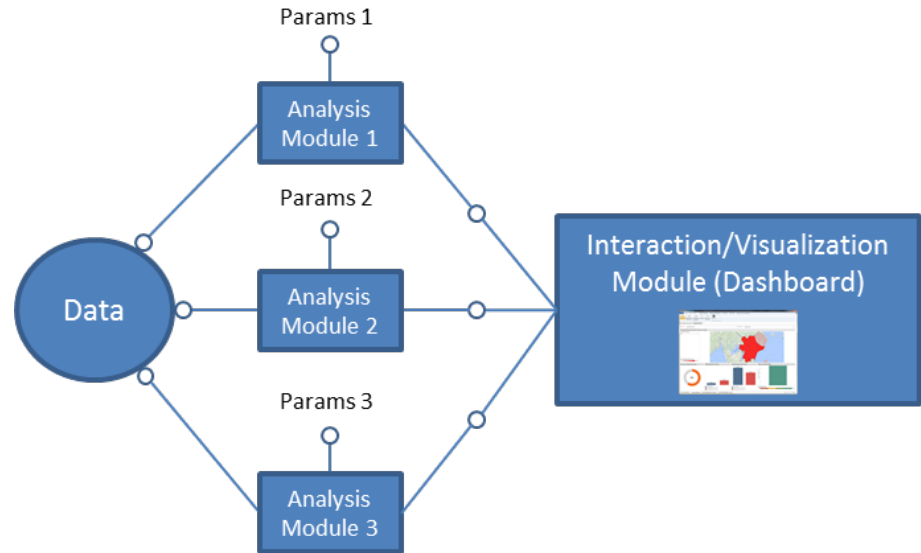
Proof-of-Concept

- To demonstrate **actionable decision support in operation planning** we use a large symmetrical scenario:

- Airstrike and entry phases consist of air-to-air and air-to-ground engagements

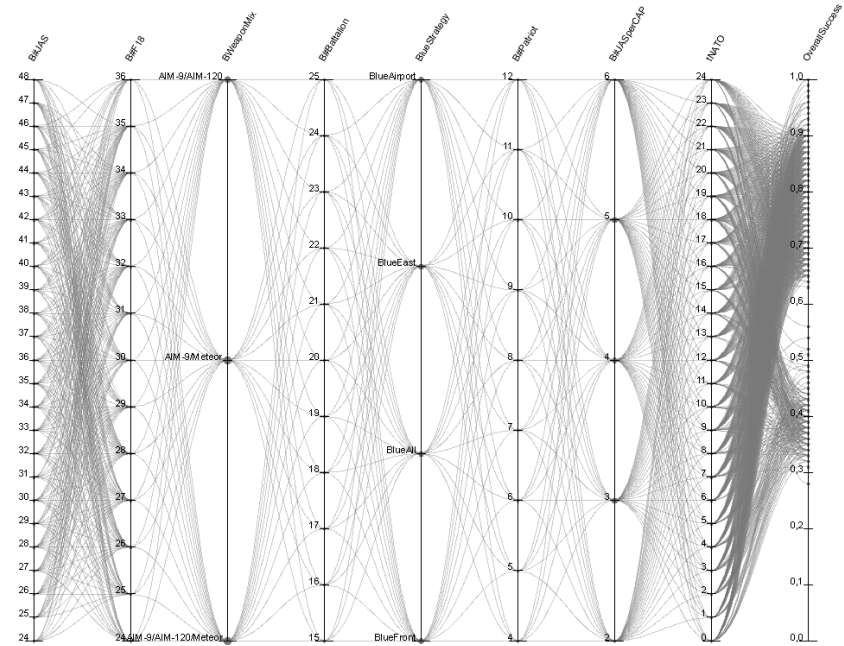- Land-attack phase consists of brigade-level engagements
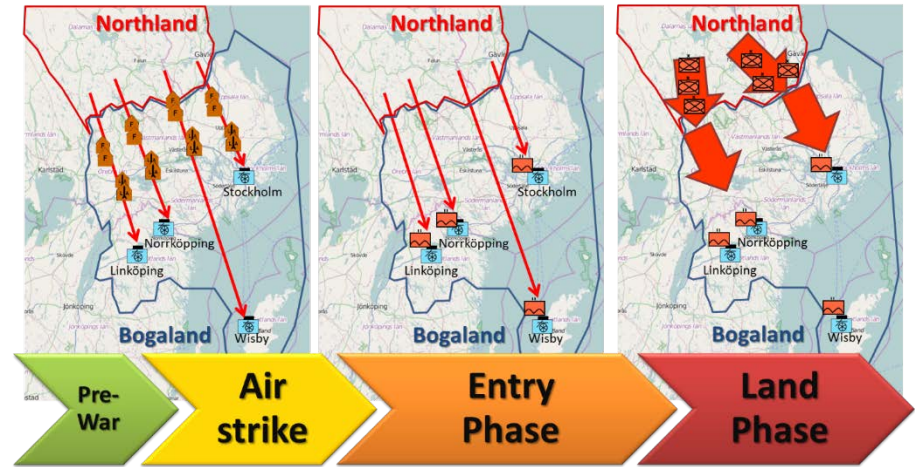
DFTOP Realisation

- **Factor Importance** give answers to questions like:

- **What are the most important factors for success?**
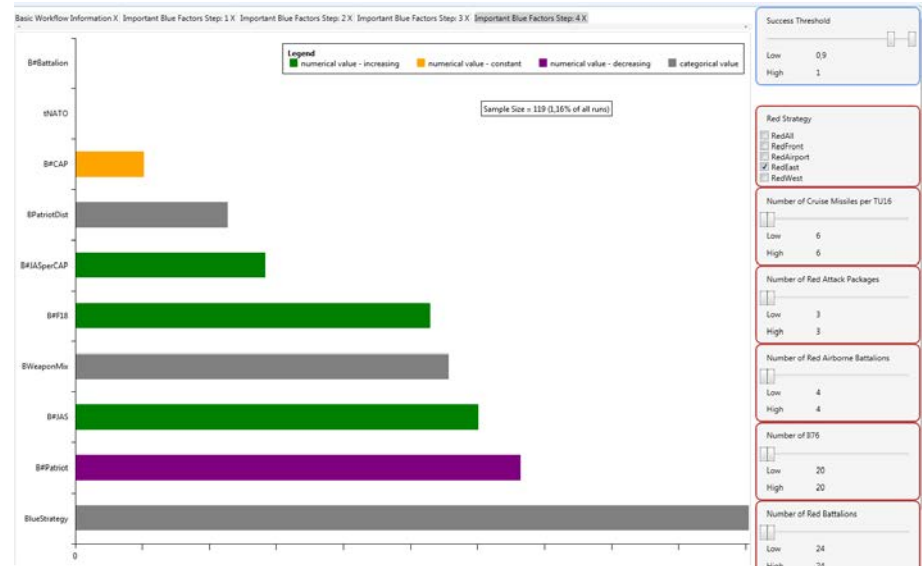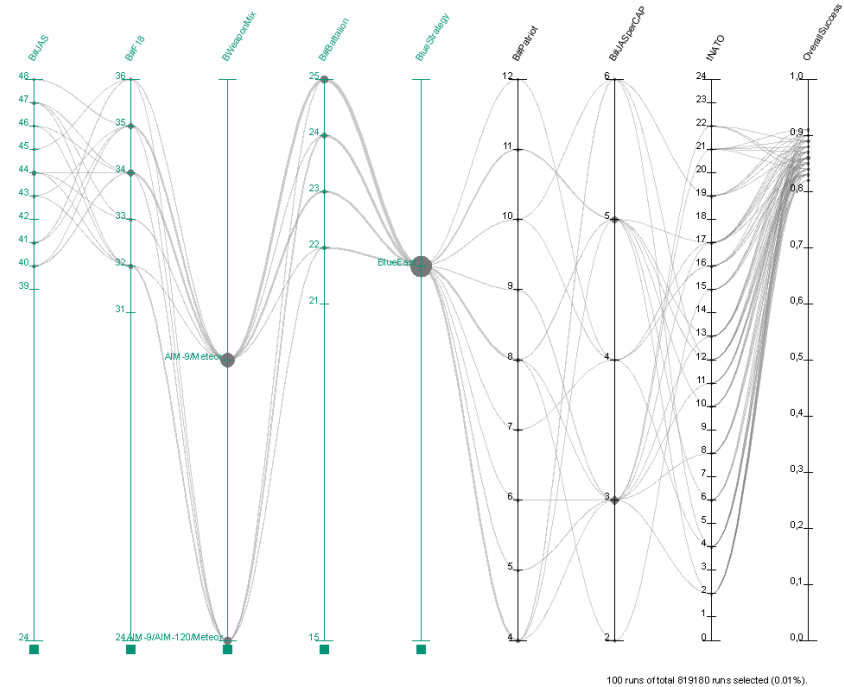
DFTOP Realisation

- A Wire Diagram visualise the effect of chosen factor values on the Overall Success
- It is used for interactive analysis

10240 runs of total 819180 runs selected (1.25%).

DFTOP Realisation

- A Wire Diagram visualise the effect of chosen factor values on the Overall Success

- It is used for interactive analysis

100 runs of total 819180 runs selected (0.01%).
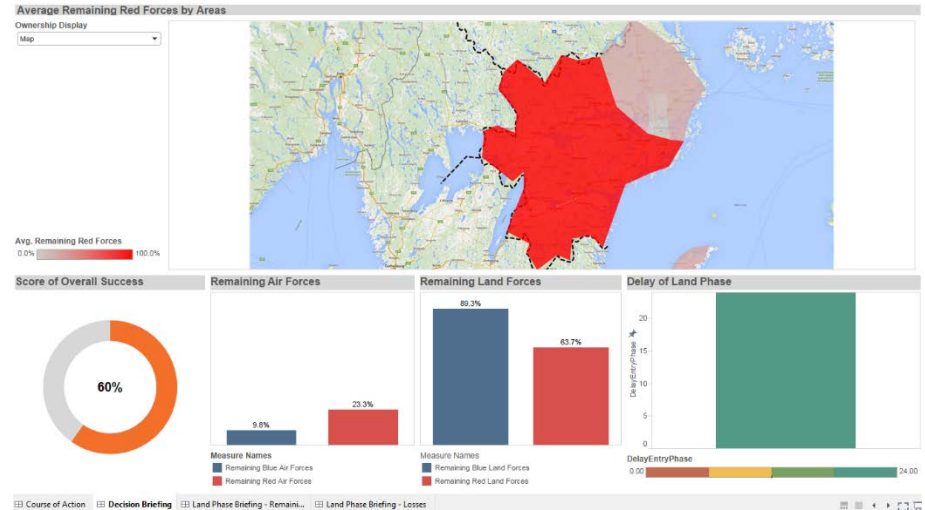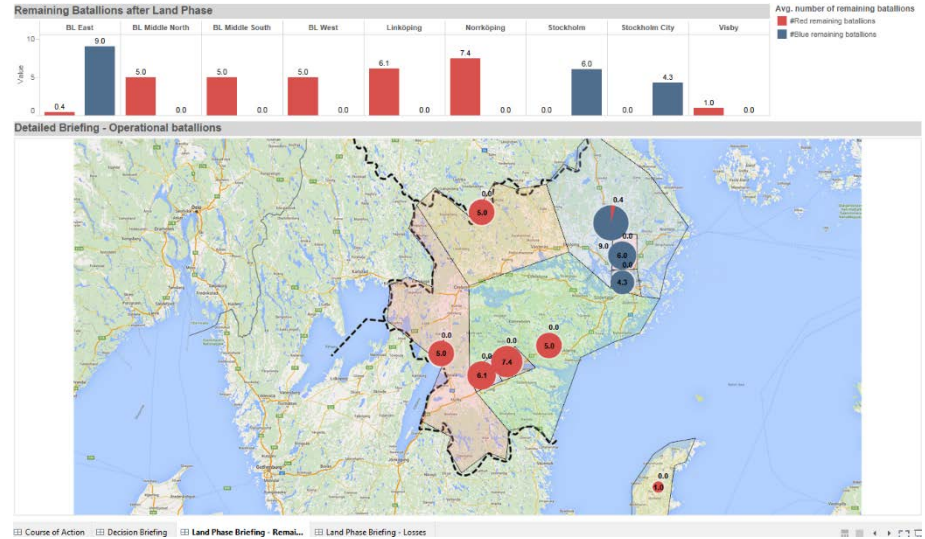
DFTOP Realisation

- The final workflow is the Dashboard

- It is designed to support the decision brief

- Overall Success of a given COA combination, and a detailed look at its criteria

DFTOP Realisation

- The final workflow is the Dashboard

- It is designed to support the decision brief

- A geographical view of losses and remaining forces

Conclusions

- DFTOP supports the Commander when evaluating operation plans
- It is aligned with COPD providing support for JOPG in Phase 3b
- It allows the Commander to get better insights into his operations
- DFTOP was demonstrated at CWIX 2016 and 2017
  - This was a milestone in establishing TRL 6

- Experience from **CWIX confirms** that DFTOP successfully brings data farming into the actionable decision-support domain, translating the analysis to visualisations that are **directly adapted to the decision maker's needs**

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