



# ARTIFICIAL INTELLIGENCE FOR AFTER ACTION REVIEW

# The Idea

- *Defence training domain AAR is particularly important in identifying teaching points*
- *Exploitation of AI to aid this is immature*
- *However many AI techniques for CGF that explore a range of options before selecting the "most appropriate"*
- *Can the range of good options be turned into a meaningful measure of the number of good options available to the decision maker?*
- *Monitor measures to identify critical Decision Points:  
Range of options drastically increase/decrease*

# Team

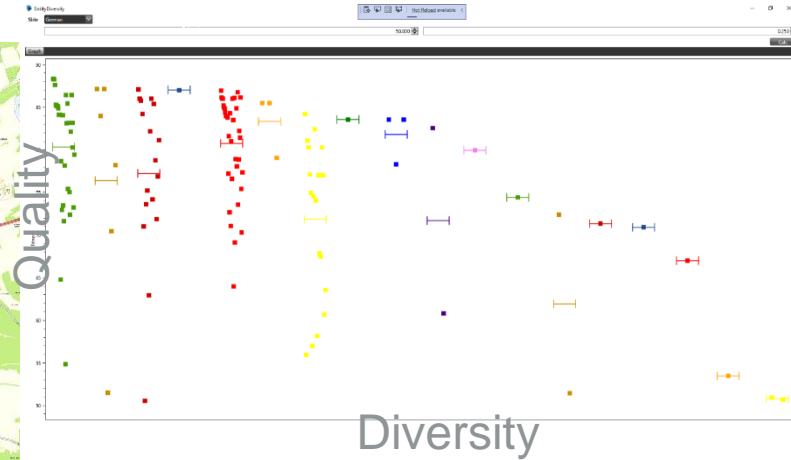
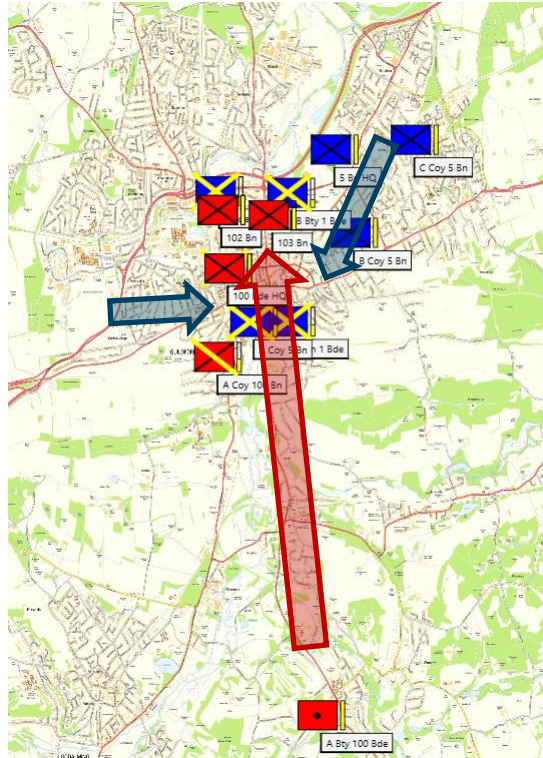
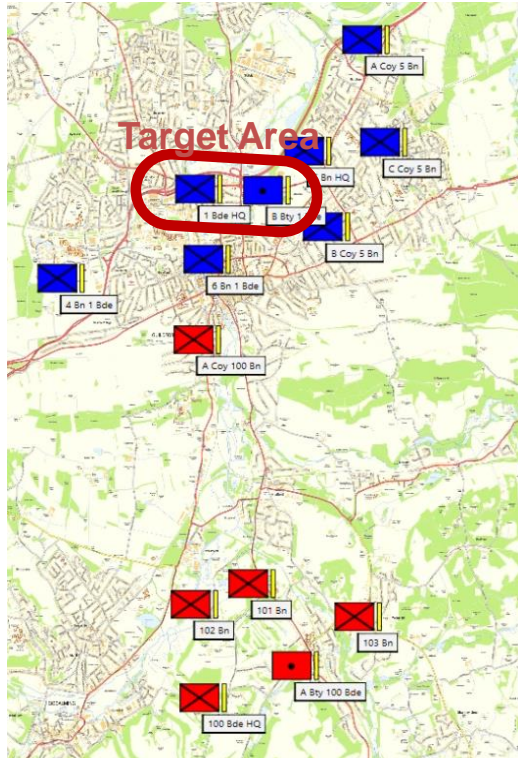
- NSC Expertise in
  - AI for CGF
  - Domain knowledge, AAR in defence exercises
- Prof. Juergen Branke
  - Expertise in multi-objective optimisation and decision making

# Approach

- Research:
  - Current use of diversity measurements in stochastic optimisation techniques, for example, multi-modal optimisation
  - Similarity measures for determining AI plan diversity
- NSC/Dstl toolset:
  - Mission Planner: flexible AI framework for CGF
  - META: brigade level land warfighting simulation
- Add plan diversity measures
- Play through example of brigade engagement
  - Plot AI diversity measures
  - Do they change at critical moments?

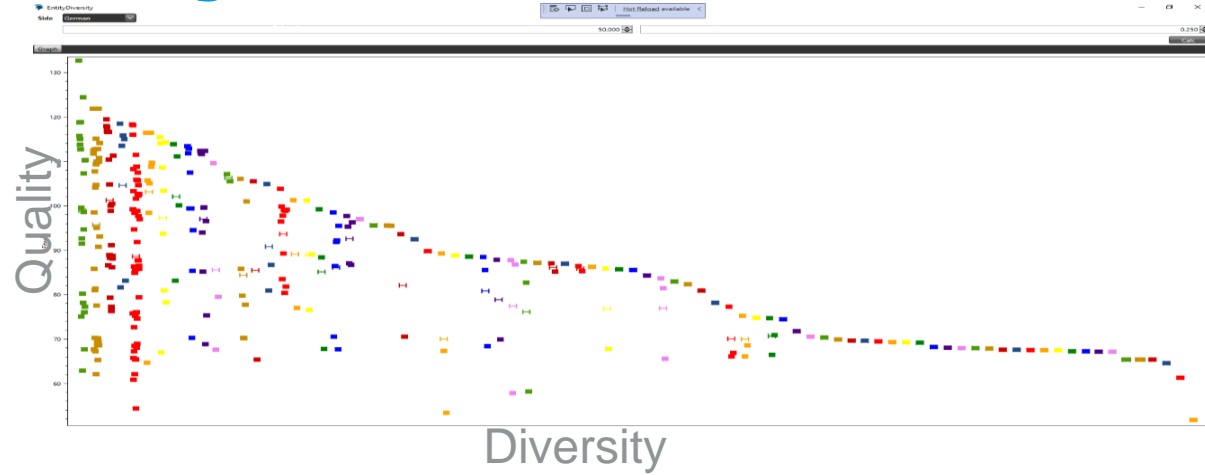
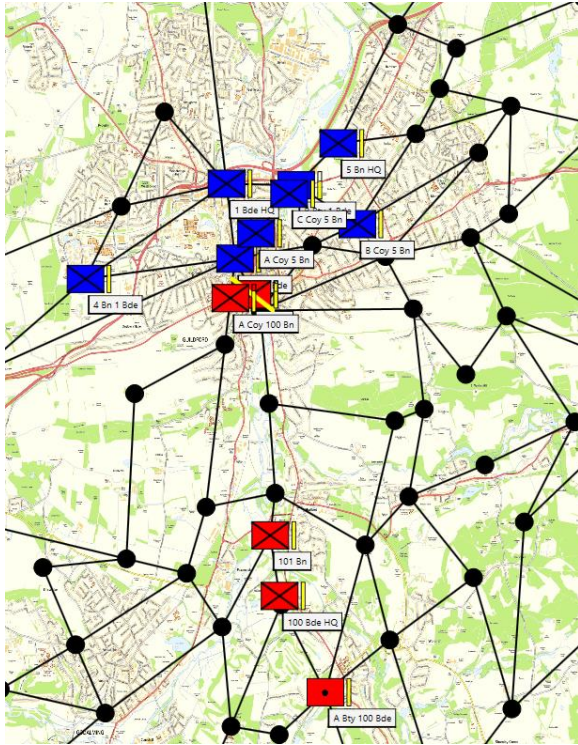


# Results – Red Initially Good



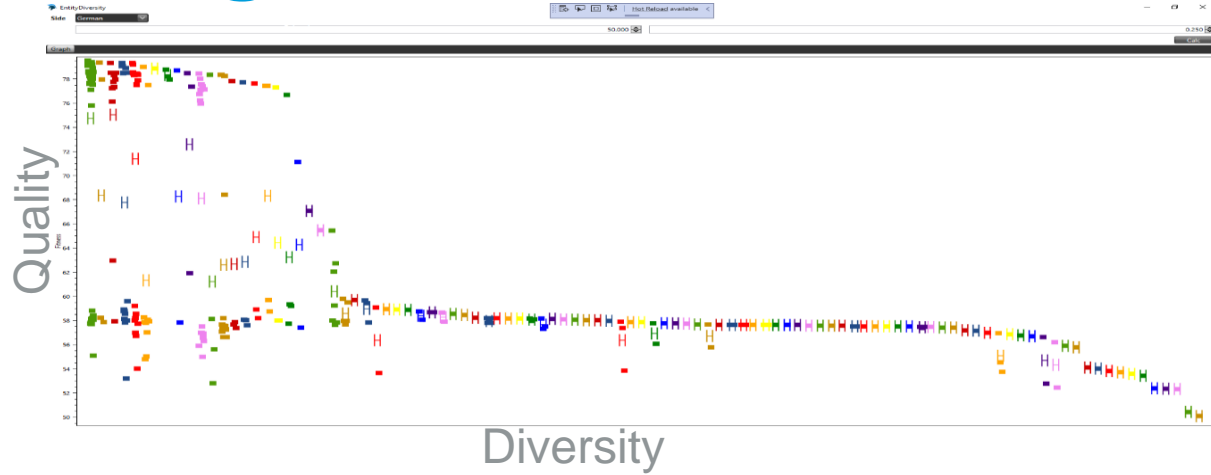
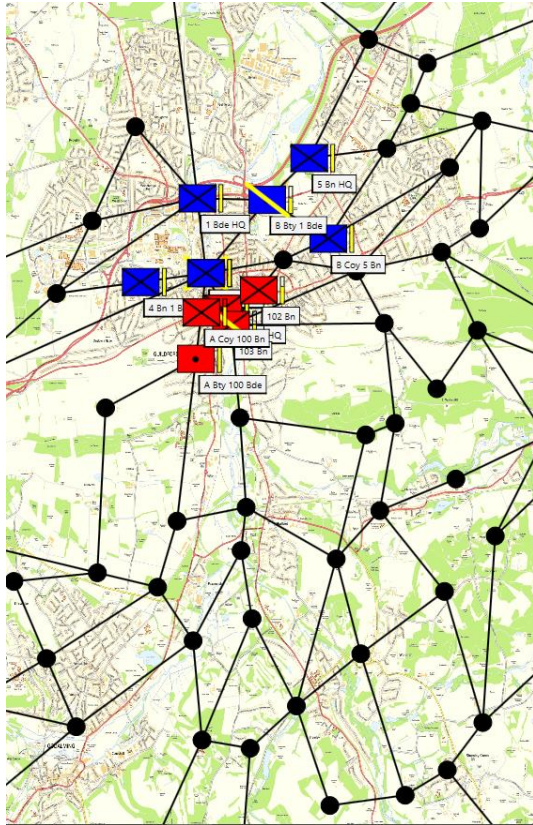
- Good range of diverse “good” plans

# Results – Red Risky



- Still range of plans with good results
- “Families” smaller with wider quality range indicates plan fragility

# Results – Red failing



- Few plans with good results
- Few “families”, many poor quality plans indicate low chance of success



# Results

- Diversity plots show correlation between diversity and options available to a commander.
  - Good range of plans, a number of families of related plans are seen to emerge.
  - Commander's choice is poor, grouping into related plans is far smaller, and the quality is poor
- Variance of the quality within plan groupings relates to fragility of plans.
  - Early indicators, identifying, in terms of plan fragility and risk, where a commander's options had not yet closed in, but has the potential to do so.

# Exploitation / Next Steps

- Identification of target training exercises
- Application of the AI toolset to a suitable simulation environment
- Analysis of a range of examples
  - Derive simple metrics for:
    - Number of good options open to the commander
    - Risk and fragility of those options
- Toolset to prove its utility across a wide range of examples.

# Conclusions

- Potential of the toolset demonstrated for AAR
- Replaying exercise toolset successfully identifies critical points
  - Number of good options changes
  - Correlate to difficulty of the tactical situation
- AAR use cases
  - Alert when in replay those critical points occurred
  - Identify points increase/decrease in the risk of operations
- Together, allow quick identification of lessons during AAR
  - Allowing maximum training benefit to be achieved