



Dedicated to innovation in aerospace

Empowering Military Decision Support through the Synergy of AI and Simulation

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Introduction

Military decision support

- Technology-driven battlefield
- Integration of autonomous platforms

AI & Simulation technologies

- AI advances
- M&S advances
- Synergies

Outline

- Decision-making process
- AI horizon scan
- Use case
- AI-enabled mission simulation



AI-enabled mission simulation



Decision support in C2

Decision making process

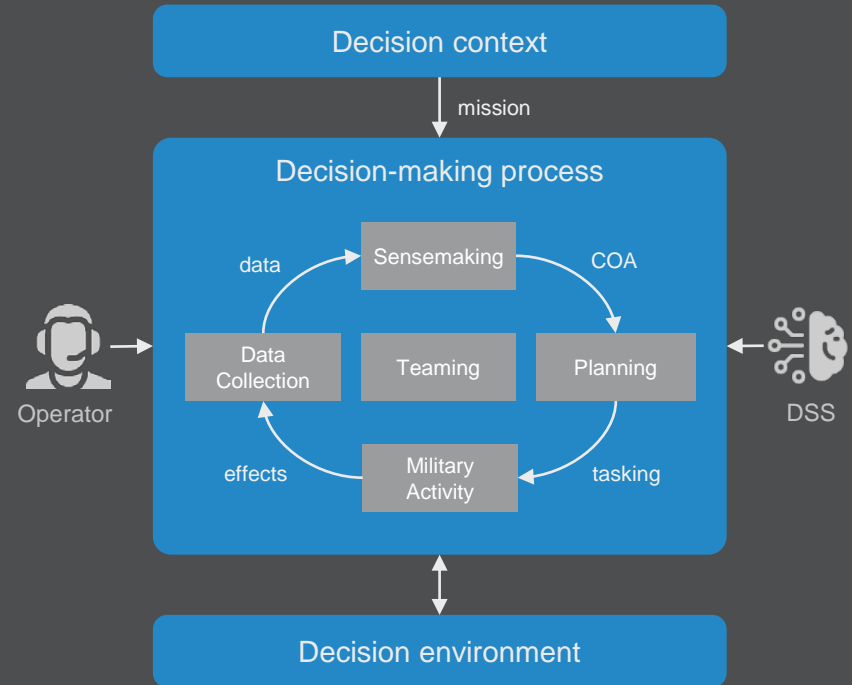
- Shared between an operator and a DSS

DOODA-loop in a C2 context

- Sensemaking
- Planning
- Military activity & data collection
- Human machine teaming

Considerations

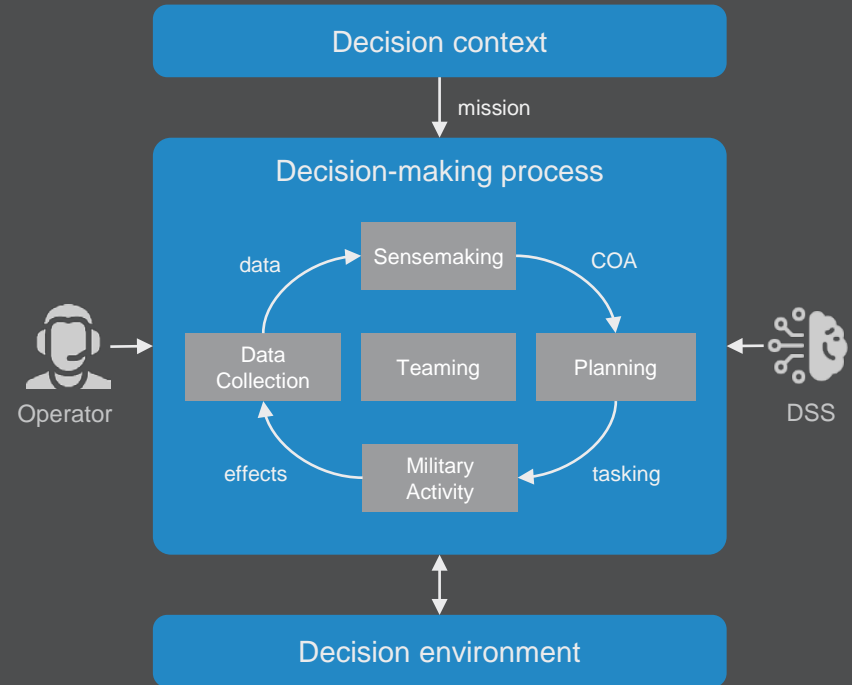
- Limitations of AI in C2
- Gradual evolution



Process based on DOODA-loop (Brehmer, 2010) & (Jensen, 2009)



AI horizon scan



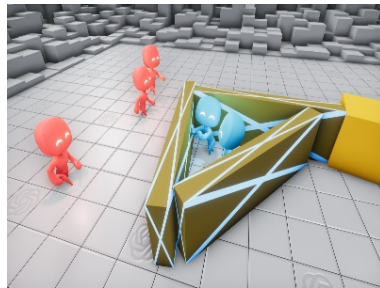
Process based on DOODA-loop (Brehmer, 2010) & (Jensen, 2009)

AI horizon scan

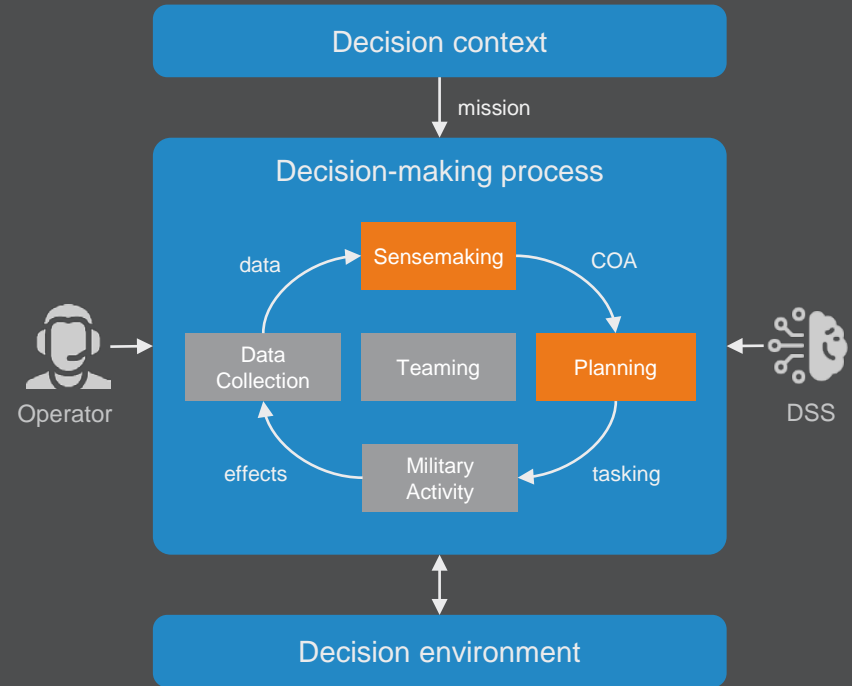
Reinforcement learning



source: commons.wikimedia.org



credit: OpenAI

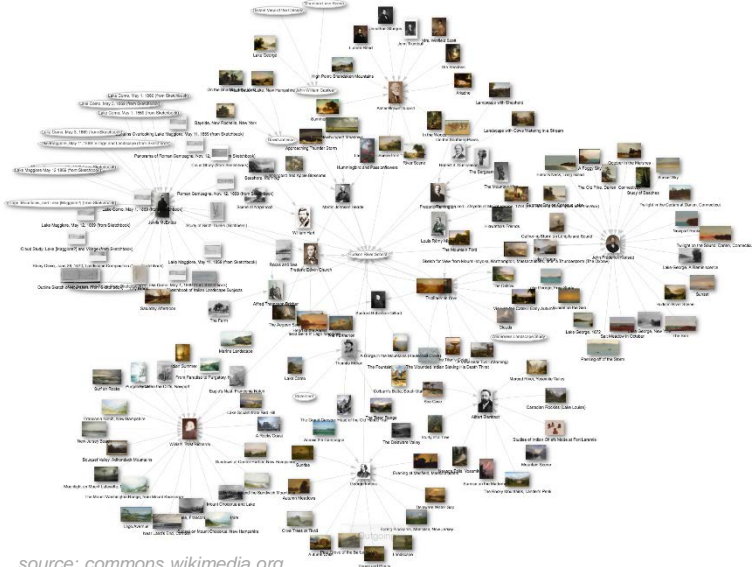


Process based on DOODA-loop (Brehmer, 2010) & (Jensen, 2009)

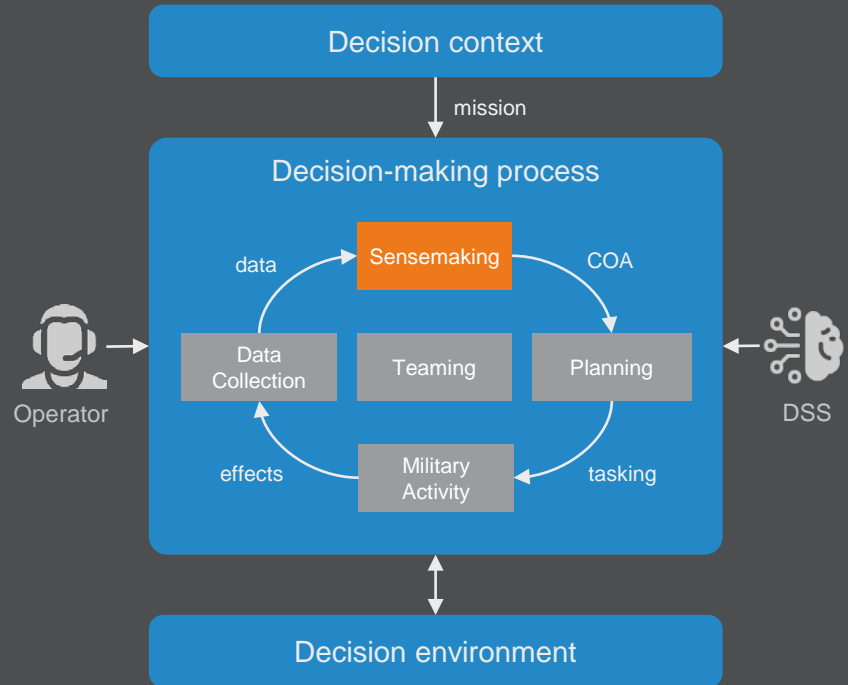


AI horizon scan

Semantic graphs



source: commons.wikimedia.org

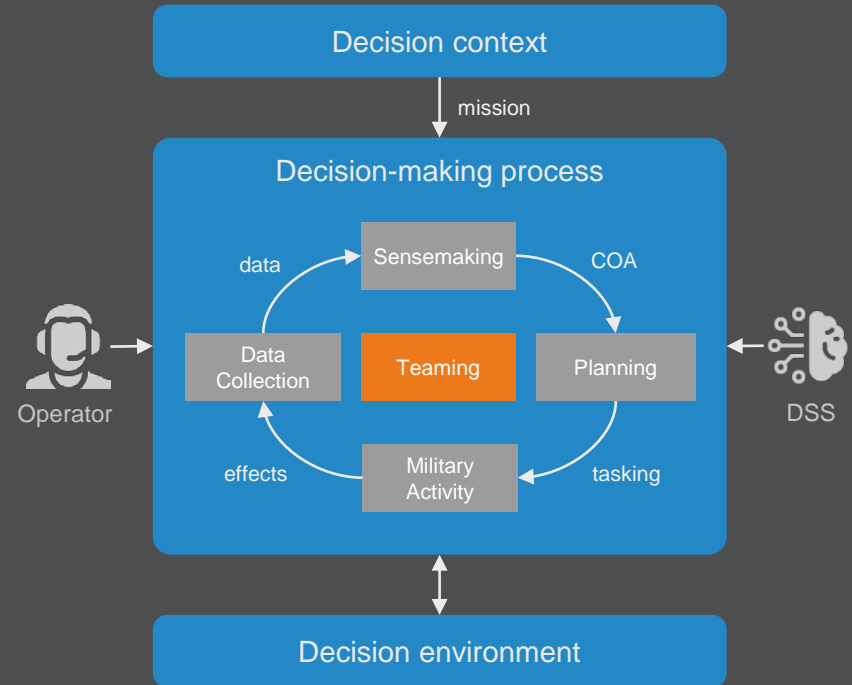


Process based on DOODA-loop (Brehmer, 2010) & (Jensen, 2009)



AI horizon scan

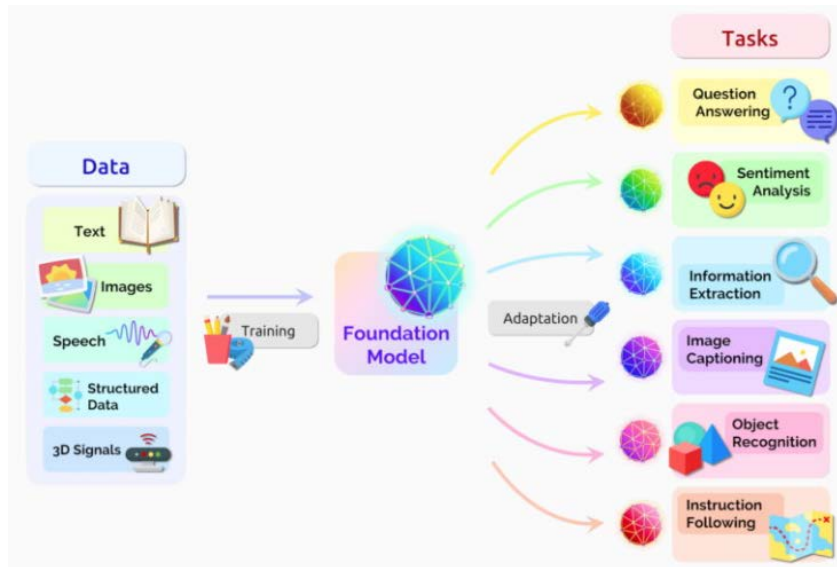
Large language models



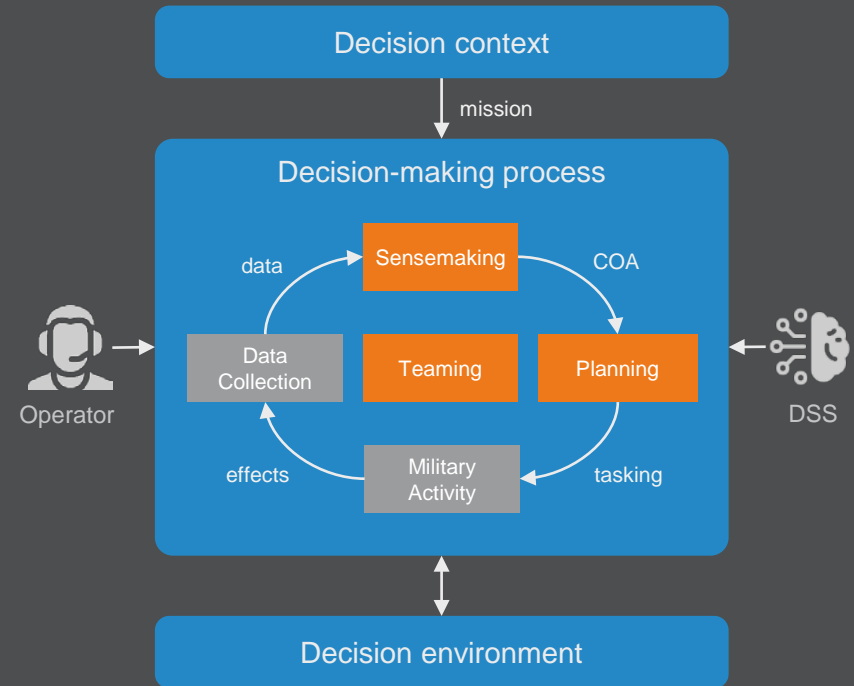
Process based on DOODA-loop (Brehmer, 2010) & (Jensen, 2009)

AI horizon scan

Foundation models



source: Stanford Institute for Human-Centered Artificial Intelligence (HAI)



Process based on DOODA-loop (Brehmer, 2010) & (Jensen, 2009)



Case: Tactical Air C2

Battle Management support

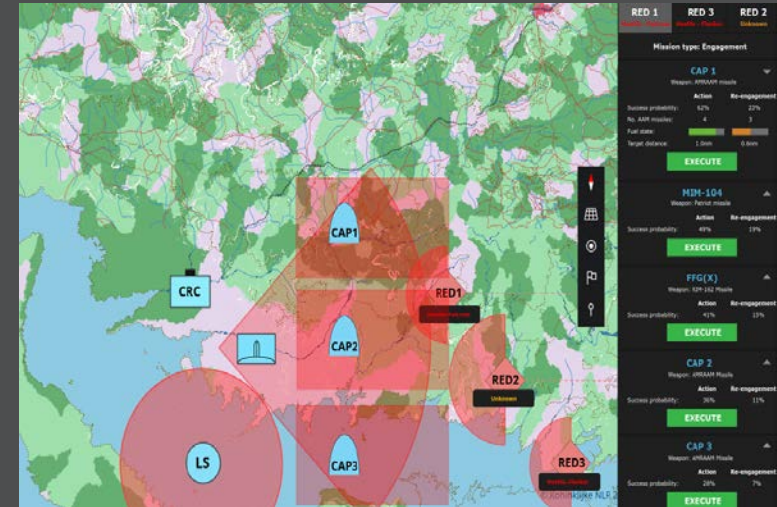
- Tasks and responsibilities

Decision support system

- COP with analytics
- Decision aid for COA development & analysis

Applications

- *Mission planning*: game plan development, what-ifs
- *Mission execution*: adaptive planning
- *Mission debrief*: post-mission analysis, lessons learned
- *CD&E*: tactics development, testing future capabilities
- *Personnel training*: command training



Operation	CD&E	Training
Planning	Execution	Debrief
Live		Simulation



AI-enabled mission simulation

Considerations for AI integrations

(AI) Training environment

- Scenario generation for smart learning strategies
- Computational demands for efficient learning

Data

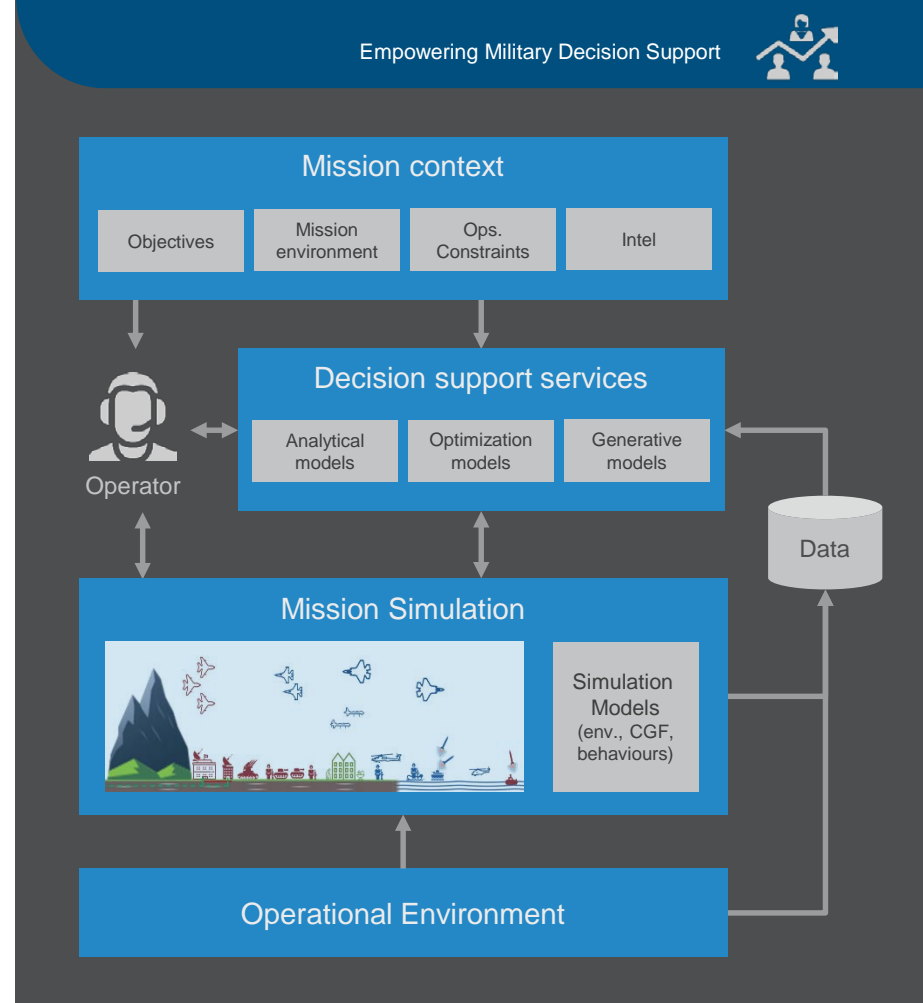
- Synthetic data generation
- Data augmentation

Digital twin environment

- Model transfer and interoperability

Mission context

- Mission-specific knowledge and rules
- Retraining and fine-tuning models



Conclusion

Lessons learned

- M&S role and platform requirements to support experimentation, validation & evaluation of IDSS

AI operationalization for decision support

- V&V, trustworthiness, data governance, ethical and legal aspects, etc.

Evolution of IDSS

- Incremental development through a holistic approach
- From isolated to more integrated functions, towards teaming



source: defensie.nl



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Fully engaged

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