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Experiments into the operation and effectiveness of Edge Organizations

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C2 Experimentation track
CCRTS San Diego
20-22 June 2006

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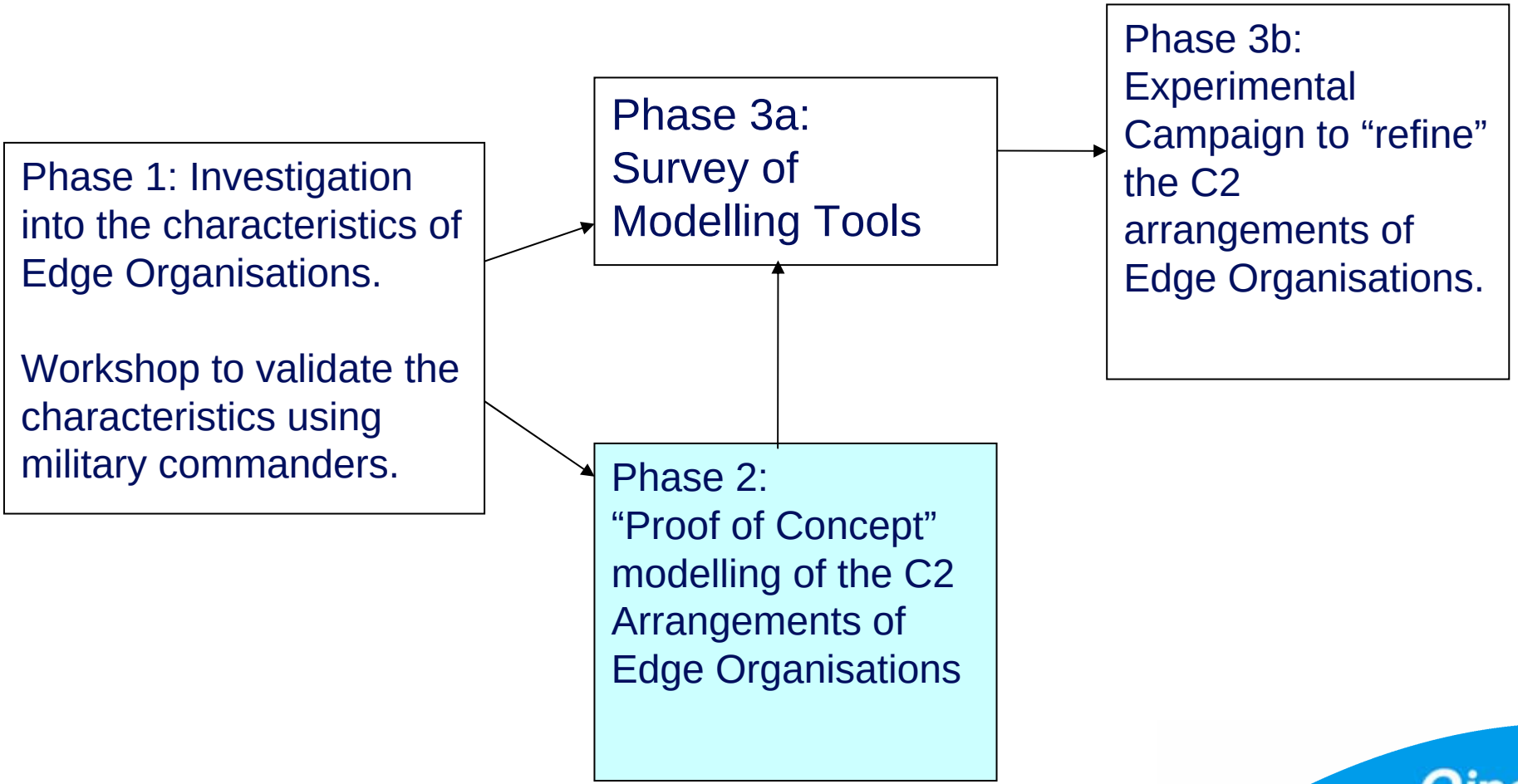
Overall programme of work (Part of CCRP)
CCRTS paper covers Phase 1 and Phase 2 only



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Proof of concept simulations

- Full experimentation will address the thesis:

"…the organizational agility of Edge Organizations allows their operating units to exert more decisive influence over a wider range of adversarial organizations within many types of operational contexts than those of less agile centralized or de-centralized organizations."

- Initial step will only simulate combat operations between organizations
  - with different force structures;
  - varying command freedoms;
  - and structural flexibility.

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Characterisations fall into three areas

- Operational Environment
  - The context in which the operation is set (including political, geographical, adversarial, economic, etc)
- Organisational building blocks
  - The materiel, infrastructures, personnel, doctrine, etc
- Organisational attributes
  - The structural linkages (interactions, interdependencies)

This will be fixed

These will be fixed

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Proof of concept simulations

	Operational Environment	Building Blocks	Organisational Attributes
Simulation run 1	Fixed	Fixed	Attacking force: Top down Defending force: Mission Command
Simulation run 2	Fixed	Fixed	Attacking force: Mission Command Defending force: Mission Command
Simulation run 3	Fixed	Fixed	Attacking force: Delayered Defending force: Mission Command

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Operational environment

Organization’s own values and concerns about impact of its actions
Organization’s perception of how others assess impact of its actions
Physical environment (weather, day/night, ease of movement, etc)
Rates of Change (of events that are particularly representative)
Target Specification (general “signal-to-noise” issues)
Terrain (e.g. urban, mountainous, flat)
Complexity of the Environment (nature and spread of knock-on interactions)
Prior models of others’ behavior modes, patterns (familiarity, “knowns”)
Boundaries (legal, tactical and operational) and their nature (fixed or flexible)
Resources (criticality of assets and ability to share)
Predictability (relates to familiarity, consistency, etc)

FIXED

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Organizational Building Blocks

Infrastructures and supporting structures
Personnel (natural restraints on activity/motivation)
Training (specific skill sets)
Doctrine (expression of)
Doctrine (use of)
Equipments

FIXED

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Organizational Attributes

Identity and sense of self
Generation, maintenance and dissemination of purpose
Groupings of operating units
Decision-making [Delegation of decision rights]
Sense making [Shared awareness of non-self]
Sense making [Perception of environment and changes]
Status monitoring and decision-making [Shared Awareness of self, including status and setting resource priorities]
Synergy [Shared awareness of self and own operation with respect to others]
Success measures

Focus of the simulations

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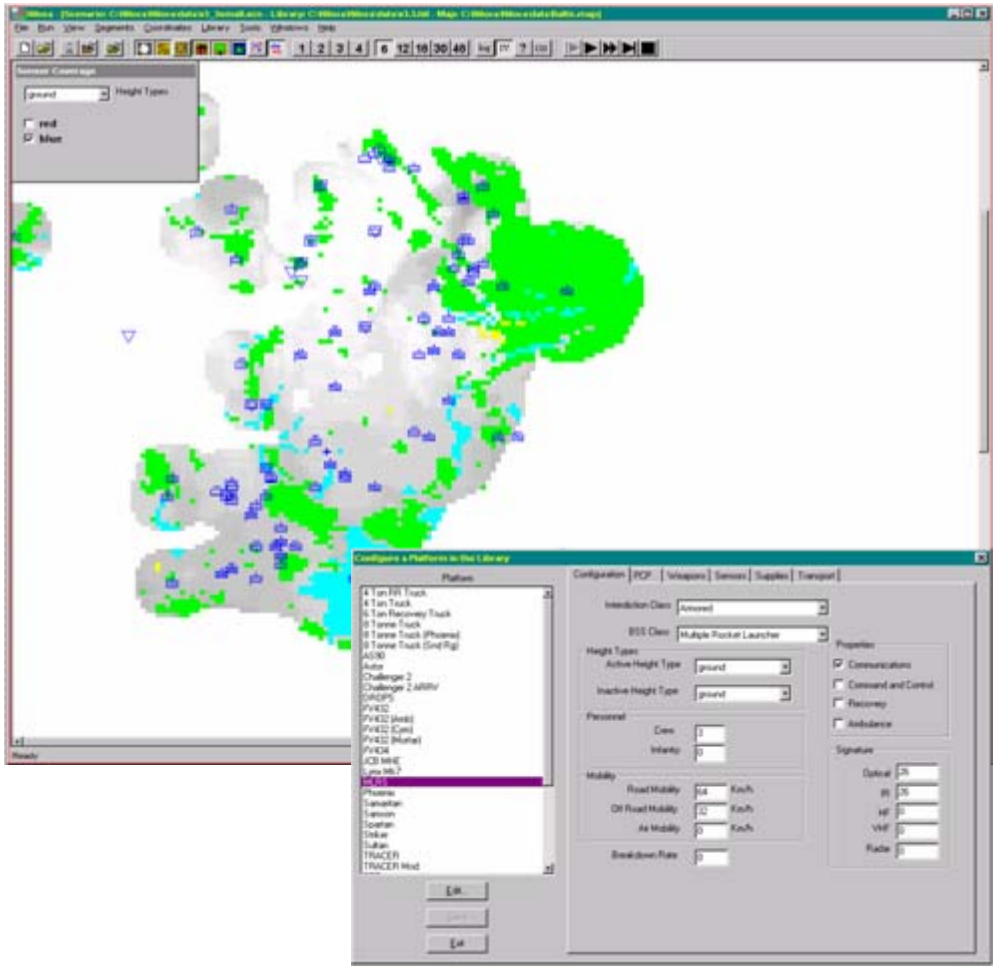
HiLOCA: High Level Operations model using Command Agents & Cellular Automata



- Dynamic analysis of C2I2 operational effectiveness
- Explicit representation of C2I2 structures, interactions and HQ functions
- User-configured building blocks for concept development
- System-of-systems studies

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HiLOCA outputs

- High level combat effectiveness measures such as casualties, force tempo and losses.
- Logistics usage and deficits
- Picture compilation metrics
- Command decisions and timings
- Sensor reports and sensor movements
- Own force status messages
- Own force movements – all units over time

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Independent variables for the simulations

- Force (ORBAT) structure (responsibility & “ownership”)
- Assignment of support units (e.g. re-allocation of artillery)
- Command freedoms (adherence to superior’s intent)
- Alberts’ grid Box 4 and Box 5 parameters
  - Own force information sharing
  - Forward movement & planning horizons
- Logistics C2 structures (demand-led or supply-determined)
- ISTAR architectures (distribution of sensor-derived info)

Independent variables for the simulations

	Force Structure (Command Layers)	Assignment of support Units	Command Freedoms
Top down (A1)	4	None	Low
Mission command (A2)	3	Long range artillery	Medium
Delayered (A3)	2	Long range artillery, Manoeuvre Units, AH	High

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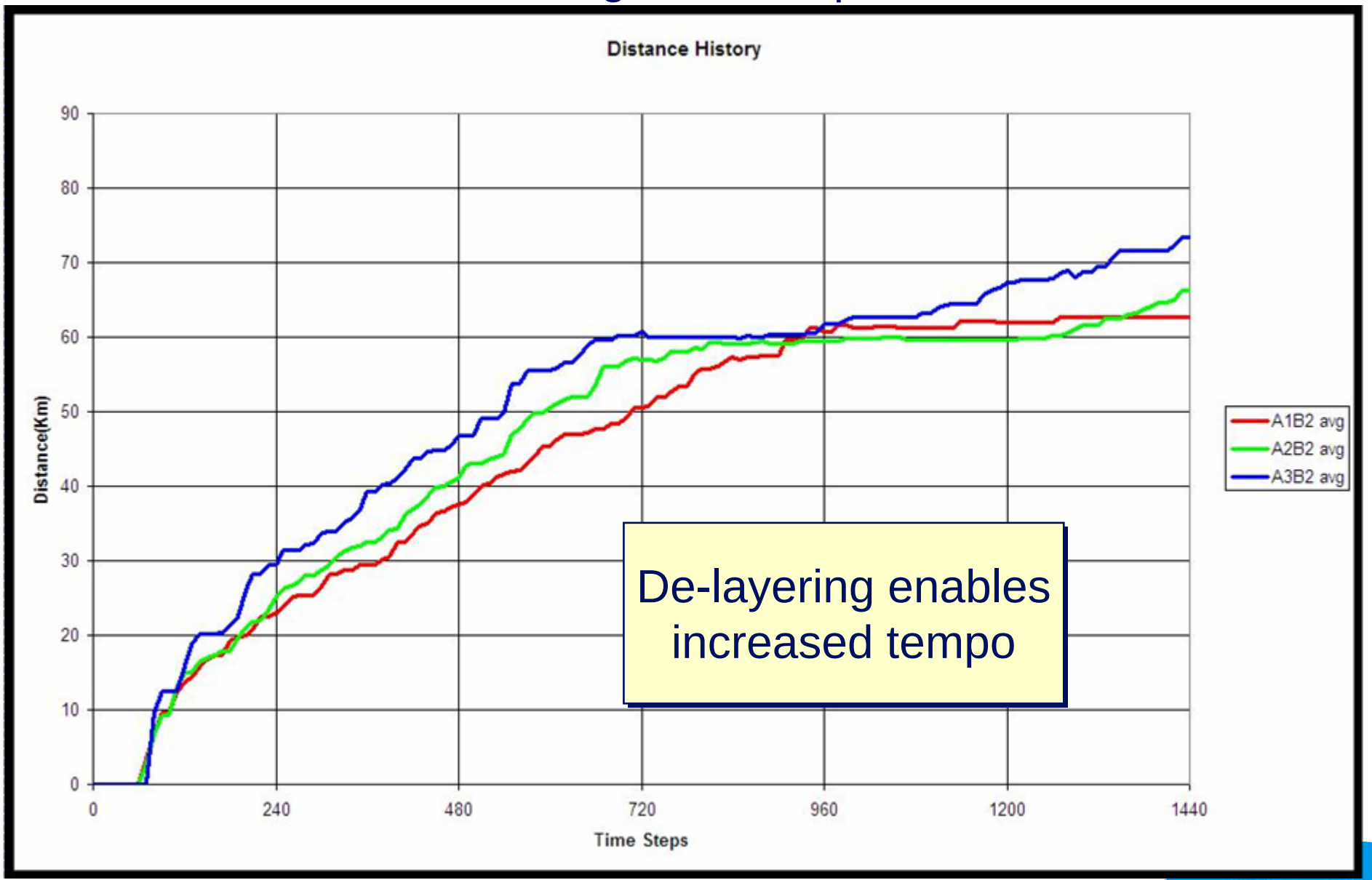
Attacking force tempo



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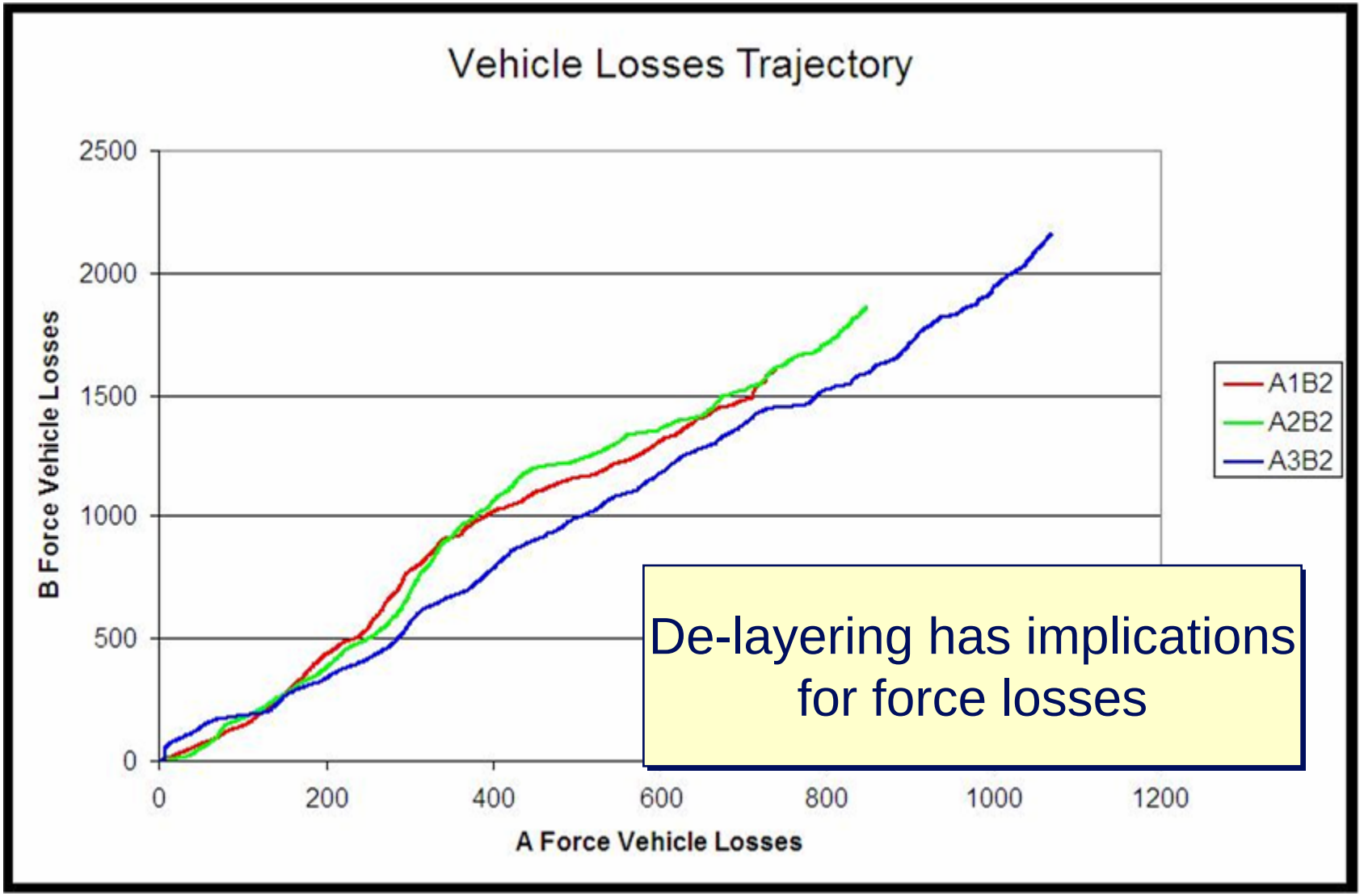

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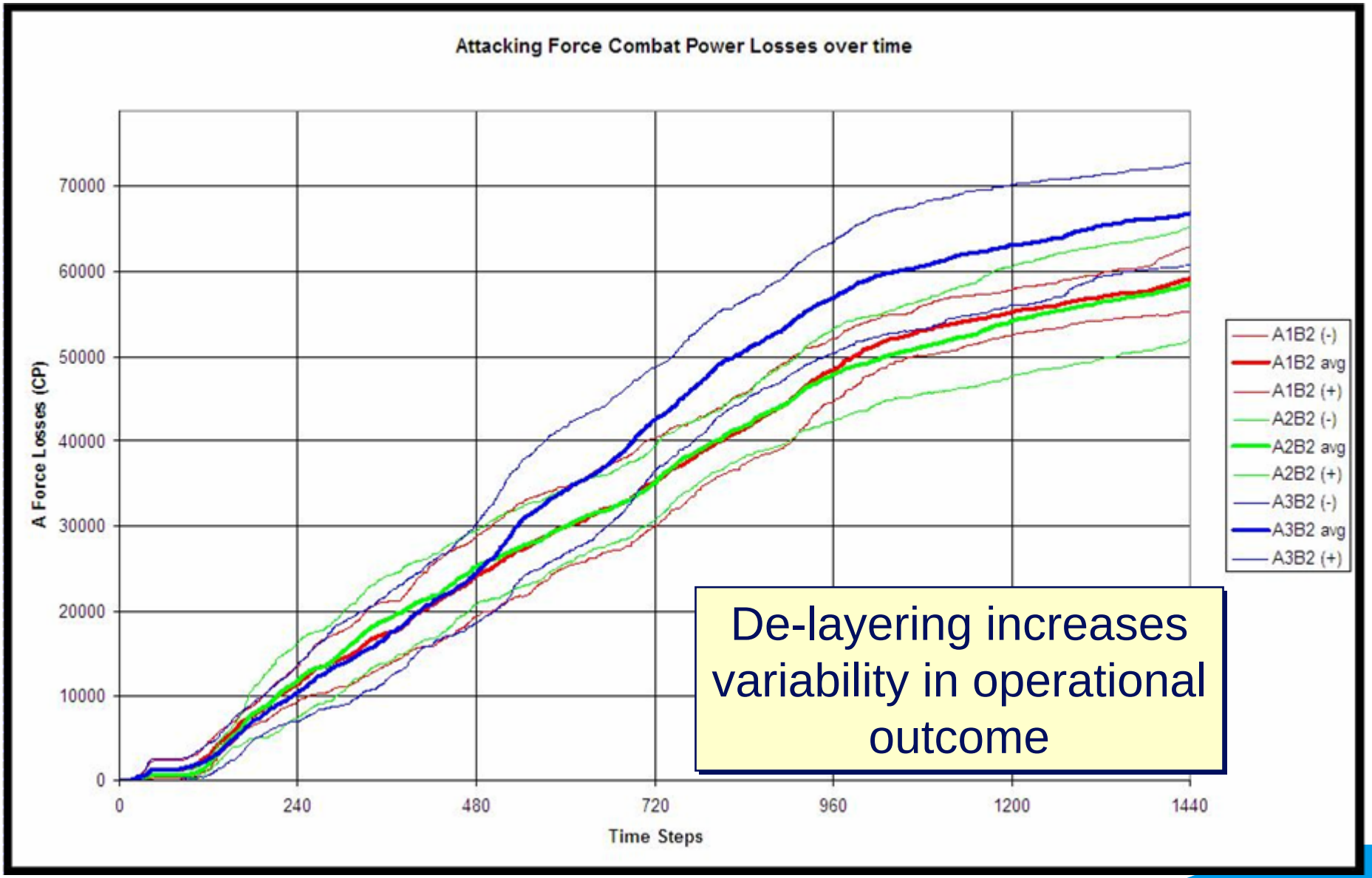

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Summary

- We have presented:
  - A taxonomy for characterising organisations.
  - An initial mapping across from the organisational attributes to the HiLOCA combat model.
  - Preliminary indications of operational effectiveness of de-layering against a fixed adversarial environment.
- We propose for future experimental phase:
  - an extended agent-based approach for structural adaptation through C2 characterisation space;
  - using focussed intervention vignettes to cover more of the C2 problem space.

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Questions?

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