



IDENTIFYING AND ADDRESSING ISSUES IN COALITION NETWORK CENTRIC OPERATIONS USING DISTRIBUTED SIMULATION

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Introduction



Adoption of network centric operations (NCO) is placing unprecedented demands upon the US military and its capability to rapidly adopt new technologies

- NCO places a premium on information timeliness
- Information as force multiplier
- Information velocity, veracity,, and security are crucial
- Challenges include bandwidth, security, and routing
 - Coalition operations compound these problems
- Lack understanding of how to translate policy into resource allocations for NCO
 - Network resources
 - Data
- Need new technologies to address coalition NCW issues







- Network and data control and management policy are critical
 - Address NCO needs
 - Releasibility (sharing) of information between partners is difficult
- Policies should be driven by needs and capabilities of users of NCO data
 - Also consider bandwidth, communication alternatives, priorities, and data security
- Changes in policy need to be made rapidly
 - Placing a premium on cyber situation awareness and tools for translating decisions into policy
- Exploit existing NATO research to help address issues









- The challenges inherent in coalition NCW operations arise from multiple sources
 - Procedures for command and control
 - Command and control structures
 - Interoperation techniques
 - Doctrine and tactics
 - Information release
 - Human behavior and culture
- Information release restrictions vary across coalition
 - Vary by partner
 - Vary based upon who is communicating
 - Released information can have additional restrictions
- Differences in technology across coalition
 - Use of spectrum, devices, and data distribution
- Non-uniform security and information assurance capabilities
 - Trustworthiness and risk of compromise varies across coalition
- Greatest challenge arises from cultural differences





- Cultural differences lead to varied interpretations of data
- Differences in interpretation can lead to conflicting actions
 - Undercuts NCO paradigm
 - Effective coalitions are based upon <u>trust</u>
- Information presentation must be so structured so each coalition partner has an identical mental model of the battlespace
- Coalition data exchange issues are crucial, hence must be addressed before onset of operations
- Simulation can be used to identify and resolve issues





Simulation



- Simulation environments can be used to provide experience in dealing with NCW coalition issues
- > Challenges
 - Need for fidelity if experience is to be useful
 - Need for high quality/fidelity CGAs to represent coalition partners at all command levels
 - To enable insights into coalition NCO
 - To enable effective training in NCW
 - To evaluate solutions to challenges posed by coalition NCW
 - To determine how to interoperate with nations that have not adopted NCW





Simulation (cont.)

Simulation environment can aid in developing and

- refining NCW procedures and techniques
 - Complexity of NCW and coalition operations
 - Different procedures for NCW
 - Different command and control
 - Differences in culture and human behavior
- Accurate simulation is difficult
 - All differences in coalition partners must be modeled
 - Military structures
 - Doctrine
 - Culture
 - Technology

Must be readily available to potential users







> Understanding of different military's

- Information security capabilities
- Information operations capabilities
- NCW capabilities
- Information technology capability
- Understand how different cultures affect evaluation of information across the coalition
 - Technology to insure common mental model of battlespace are needed
 - Identical information used in different manners in different cultures
 - Proper prioritization of information among coalition members is crucial
- Exploit ongoing NATO effort Virtual Institute





NATO Research & Technology Organization

Command and Control

- Conduct and Promote Cooperative Research and Information Exchange
- Support the Development and Effective Use of National Defence Research and Technology to Meet the Military Needs of the Alliance







The Virtual Institute



- A distributed computing environment to host experiments, exercises, lectures, symposia, and collaborations
- For research, model development, sharing, and evaluation

RTO strategic plan

- Recommended by NATO LTSS which led to SAS-ET V
- Research & technology strategy for nato,vol 2: implementation
- NATO M&S master plan

Reduce cost

- Efficient mechanism for information exchange and collaboration across the NATO nations
- Foster inter-RTO panel research
- Faster research distribution
- Reduce duplication of effort







Human behavior plays a major role in network centric warfare in asymmetric environments

- Internally in achieving improved effectiveness in considering cultural, structural and interoperability issues
- Externally in the context of effects based operations in assessing opponents, neutrals and friends
- Research and development efforts are extremely varied across nations
- Area must incorporate multiple significant bodies of work
- > Active research groups both in the US and internationally







- > Reduce cost per experiment/exercise
- Reduce elapsed time between experiment/exercise conception and execution
- Improve re-use/exploitation of prior work
- Improve access to international expertise
 - For set-up, execution, and analysis
- Increase scale & scope of coalition exercises and experiments
- Develop and evaluate procedures to insure common mental models are formed among coalition
- Enables improved R&D to address coalition issues
 - For addressing network-centric warfare and counter-terror issues
 - Due to repeatability, consistent data gathering, improved analysis



Virtual Institute Organization



- Organization mirrors major research focus areas
- Adapts to changing requirements/taskings
- Four permanent components of the institute



Virtual Institute Operational Concept



- Define
- Integrate
- > Execute
- > Assess
- Share







- National culture and experience influences how NC capabilities are employed and can be cause of misunderstandings
- Culture influences how information is evaluated and prioritized
- Experiments to highlight, understand and manage differences
- Virtual institute can help to overcome cultural chasm and help forge understanding
 - Experiments, and resultant simulations, can build trust and start socialization process
 - Socialization at group and individual levels key to coalition success

Experiments needed in order to identify cultural components that are key to forming efficient coalitions

Avoid culturally-based errors





- Develop understanding of coalition members information security and cyberwarfare capabilities
- Develop tests for cybersecurity capabilities, data interoperability, and security that can be applied across coalition
 - Common understanding of coalition cyberwarfare capabilities
 - Develop trust and confidence in partner's information protection technologies
- Determine how different cultures respond to cyberattacks
 - Operationally and psychologically
 - Prepare and evaluate procedures





Virtual Institute - Common Mental Model



- Investigate cultural issues that affect formation of mental model of battlespace
- Investigate needed communications
 - Bandwidth, security, redundancy, flexibility, content
- Investigate how to structure information flow, content, and exchange
- Investigate how to deal with technology mismatches
 - Maximize coalition optempo by adapting to optempo and information tempo of coalition partners
- Investigate number of communication channels needed in coalition
 - Driven by volume, security, releasibility, timeliness, half-life
 - Data, voice, video



Virtual Institute - Commander Support

- Real-time environment to evaluate operational plans
- Compare plan to real-world to identify key mismatches
- Compare plan to real-world to identify misunderstandings





Conclusion



- Coalition NCW is crucial to future military operations
- Simulation in virtual institute can measure success and address open issues
 - Challenges spring from many sources
 - Cultural, human, military structure, technological means, doctrine, and tactics
 - Cultural differences seem to be especially important
 - Virtual Institute can play a significant role
- Virtual institute can investigate spectrum of coalition issues at reasonable cost in a timely manner
- Virtual institute can permit regular, ongoing experimentation
- We have reviewed some of the issues that simulation can address





Future Work



- Regular simulation experiments among coalition partners
 - Hypotheses, measurements, and metrics required
- Address coalition operational issues within simulation experiments

