

Multinational Information Sharing and Collaborative Planning Limited Objective Experiments

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Abstract

This paper presents a plan for conducting a series of Multinational Information Sharing and Collaboration Limited Objective Experiments (LOEs). The experimental goal is to better understand how multinational partners should share information and do collaborative planning and execution in the future. The Multinational LOEs are also intended to aid in defining multinational participation in Olympic Challenge 2004 (OC04), a major U.S. experiment that will examine Rapid Decisive Operations (RDO) in the 2010-2020 timeframe.

The first Multinational LOE scheduled for November 2001 focuses on collaborative planning with Multinational partners who are planning RDO when the planning time is short. The experiment compares the plan developed using a sequential process with a plan using an interactive planning process. The sequential planning process is adapted from the Multinational Interoperability Council (MIC) Lead Nation Concept, and the interactive planning process is based on the Joint Interactive Planning (JIP) Concept. JIP supports RDO Operational Net Assessment (ONA), the continuous analysis of adversary capabilities focused on a limited number of likely courses of action.

LOEs are designed to be both discovery events and structured experiments. Since LOEs are pilot efforts for the larger more complex events that follow, there is an element of discovery that is extremely useful. It is far better to discover flaws in a small venue when corrections are easier rather than a large public event where correction is difficult. The Multinational LOEs are also structured to examine assertions made by The JIP Concept. Measures and associated data collection quantify the degree to which information sharing and collaboration take place under different conditions.

Multinational participants connect through either the Combined Federated Battle Lab Network or the World Wide Web for LOE participation. A scenario and associated information are distributed to the participants prior to the experiment start. Each participating nation forms small planning staffs. The staffs develop plans that respond to tasking presented during a number of vignettes. Each participating nation has the opportunity to be the lead nation and prepare an operational course of action that responds to a vignette tasking. The other national planning cells review and comment on the lead nation plan and the plan is modified as necessary. For comparison, planning cells also develop courses of action using collaborative tools that facilitate interactive planning.

Introduction

This paper presents the approach the U.S. Joint Forces Command Joint Futures Lab (JFL) in Suffolk, Virginia, is using to conduct Multinational Information Sharing and Collaboration Limited Objective Experiments (LOEs) over the next three years. The focus of the paper is on the first LOE, which looks at distributed multinational collaboration.

The Multinational Information Sharing and Collaborative Planning LOE series is the first JFL initiative with multinational partners intended to define and refine coalition participation in Olympic Challenge 2004 (OC04), which will examine Rapid Decisive Operations (RDO) in the 2010-2020 timeframe. As the name implies, these LOEs explore information sharing and collaboration during RDO with coalition partners, albeit in a limited venue. Information sharing and collaboration are key support elements of the Operational

Net Assessment (ONA), the continuous analysis of adversary capabilities that produces likely courses of action. The first LOE of the series, scheduled for November 2001, focuses on collaboration. The intended LOE outcome is a set of findings and recommendations that can serve as a procedural foundation for coalition participation in OC04. The second and third LOEs concentrate on information sharing and the command and control organization, respectively.

Multinational LOEs are designed to be both discovery events and structured experiments. Since LOEs are in one sense pilot efforts for the larger more complex events that follow, there is an element of discovery, which can be both positive and negative and extremely useful. It is far better to discover flaws in a small venue when corrections are easier rather than a large public event where correction is difficult if not impossible. In other words, the LOE is a very useful risk mitigation instrument for the major field experiments like OC04. Reduced resource requirements when compared to the larger experiments and greater scientific control with fewer degrees of freedom also make LOEs attractive. The Multinational LOEs are also structured to assess capabilities. Measures and associated data collection quantify the value of information sharing and collaboration under different conditions.

RDO Operational Net Assessment

ONA provides the essential foundation for knowledge-based operations. It is a continuously updated analysis of adversary capabilities focused on a limited number of likely courses of action. It is supported by all coalition collection assets and analytical expertise and addresses not only the adversary's war fighting ability, but also the strategic and operational context that supports it. Examining political, military, economic, social, and infrastructure (PMESI) systems and their interactions is the start to understanding how best to execute RDO.

The analysis and subsequent understanding of the nature, structure, and vulnerabilities of adversarial elements identify the critical nodes and centers of gravity in the adversary's "system of systems." ONA is dynamically updated to support an ongoing planning process for each selected contingency. ONA utility extends from peacetime interaction with potential adversaries through the conduct of rapid decisive military operations. Given the level of understanding provided by the ONA, RDO planners, assisted by decision support tools, can identify appropriate "defeat mechanisms," the body and sequence of means to destroy the adversary's coherency, and coerce him to actions that are favorable to national and coalition interests. The objective is to provide the decision makers with a current analysis of the adversary's capabilities and vulnerabilities, as well as an array of effects-based options that can be applied to adversary courses of action as they are identified. Figure 1 shows the ONA elements.

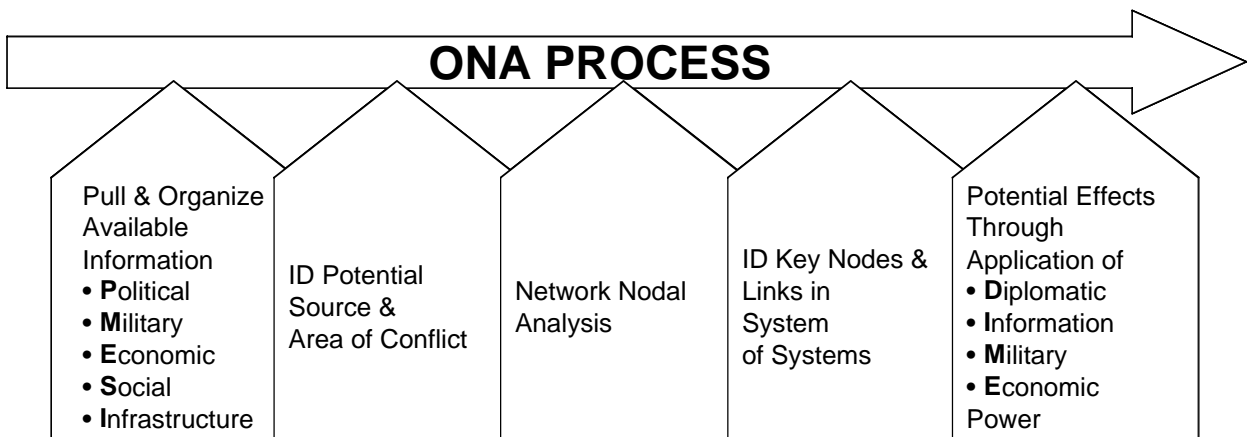


Figure 1. ONA Process Elements

The RDO concept, including the ONA element, is enabled by three information superiority concepts: Common Relevant Operational Picture (CROP), Joint Interactive Planning (JIP), and Adaptive Joint Command and Control (AJC2). CROP provides shared awareness of the operational situation, JIP enables concurrent collaborative planning using decision support tools, and AJC2 allows the commander to tailor his command and control organization to best respond to the situation. The Multinational LOE series addresses each supporting concept.

The first LOE focuses on JIP by comparing an interactive planning process embodied in the JIP process with a more traditional sequential planning process. The JIP Concept asserts that interactive planning produces a product in less time that is superior to the product produced by traditional sequential planning when planning times are short. The Multinational LOE uses a sequential planning process adapted from the “Lead Nation Concept in Coalition Operations” prepared by the Doctrine, Plans and Procedures Multinational Interoperability Working Group (MIWG) of the Multinational Interoperability Council (MIC). RDO ONA and Lead Nation processes are too large and complex to examine during a LOE, so a comparison of appropriate subsets of both planning processes is the focus of the LOE. Thus, the first Multinational LOE concentrates on developing a course of action (COA) in response to a developing regional situation.

Multinational LOE Framework

The Multinational LOE uses a series of operational vignettes to compare COA development using the Lead Nation sequential planning approach with the RDO JIP interactive planning approach. Each nation will form two planning staffs. During each vignette, one national staff will participate in the Lead Nation approach, and the other staff will participate in the RDO JIP approach. Each approach will develop a COA. The COAs will be the basis for post-LOE analysis. The two planning approaches are depicted in figure 2.



Figure 2. Multinational LOE Planning Processes

Under the Lead Nation planning approach, one national staff is designated as the lead nation and is responsible for developing the initial COA. The remaining national staffs iteratively review and comment on the plan prepared by the lead nation staff. The lead nation staff finalizes the plan based on coalition nations staff inputs.

Under the RDO JIP approach, one national staff is designated as the Combined Joint Force Headquarters (CJFHQ) and leads the development of a COA through continuous interaction.

All operational vignettes use the same scenario, which will be distributed to all participants prior to start of the LOE. Scenario supporting information, which includes ONA items, is also provided to the participants. The scenario is not classified to keep the LOE administrative burden low. Participants are permitted to supplement the provided information with open source information obtained from the World Wide Web (WWW) during the vignettes. For this LOE, open source information is information available through legal and ethical means, available to anyone, and not classified.

The Multinational LOE represents on a small scale and uncomplicated way the connectivity, information sharing, and collaboration mechanisms needed to conduct an ONA during RDO in 2015. The LOE focus is on procedures that enable coalition participation in an ONA. The Multinational LOE assumes virtual private workspaces where unique encryption and peer-to-peer communication and computation are commonplace.

Geographically dispersed nodes are connected through gateways to a wide area network (WAN) for the first LOE. Each node also has a local area network (LAN) linking workstations at staff positions. The Multinational LOE uses either the World Wide Web (WWW) or Combined Federated Battle Lab (CFBL) Net, a WAN dedicated to supporting year-round experimentation involving the combined research labs of CFBL¹ members. The U.S. node, which includes the U.S. headquarters cell and the LOE Control Cell, is located at the U.S. Joint Forces Command Joint Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) Battle Center (JBC) in Suffolk, Virginia. The location of other national HQs is at the discretion of each participating nation. Figure 3 depicts a notional Multinational LOE network topology.



Figure 3. Multinational LOE Operational Topology

¹ NATO through the NATO Consultation, Command and Control Agency (NC3A) and the Combined Communications Electronics Board (CCEB) whose membership includes Australia, New Zealand, Canada, United Kingdom and the United States.

Multinational LOE Collaboration Tools

The focus of the first Multinational LOE is on distributed collaboration among the participants. The following are the functions generally needed to collaborate and share information over a WAN and are available to the participants:

- File distribution
- File sharing
- Web browsing (synchronous and asynchronous)
- Text and voice chat (broadcast and point to point)
- Electronic mail distribution
- Interactive drawing board
- Multi-media player (audio and video)
- Calendar scheduling.

The collaboration environment must be intuitive and easy to understand and operate. The assumption is that the LOE participants come from several organizations, have not worked together before, and are probably unfamiliar with the concepts being examined. The LOE is about comparing two approaches to developing COAs and not learning a new tool set. There is some indoctrination and orientation on the collaboration tools prior to the LOE, but more emphasis is placed on familiarization vignettes to permit the participants to become comfortable with concept processes that will be used during the LOE. The week prior to the LOE concentrates on tool set familiarization and short work-up vignettes to exercise the participants on the processes to be used during the LOE.

Commercial-Off-The-Shelf (COTS) products make up the collaboration tool set. The main collaboration tool is Groove, a peer-to-peer (P2P) collaboration tool developed by Groove Networks (www.groove.net). Groove lets users work in secure shared spaces for sharing information and collaboration. Any change made in the space is automatically distributed to all members of the space. Collaboration in the space can be in the form of voice and text chat, threaded discussions, file sharing, sketch boards, outline sharing, web browsing, and the like. The collaboration can be either synchronous or asynchronous.

Another COTS product to support collaboration is Team Brain, a collaboration space accessed through a web browser developed by The Brain Technologies (www.thebrain.com). Team Brain allows users to record and link objects known as “thoughts.” Thoughts are about anything – people, places, activities, and information. The thoughts are linked as hierarchical, parent-child relationships, or as associations. Thoughts can also be linked to notes, files, and threaded discussions. Team Brain can be accessed through the web browser in a Groove space. Figure 4 shows a Groove shared space with Team Brain accessed through the web browser in the space.

Multinational LOE Conduct

The LOE consists of eight operational vignettes conducted over a two-week period where small planning staffs from participating nations are tasked to develop COAs in a relatively short period of time. Each nation has two planning staffs participating in each vignette. One staff plans based on the MIWG Lead Nation concept, and the other staff uses the RDO JIP concept. One nation is designated as the lead nation for the Lead Nation approach, and another nation is designated as the CJFHQ for the RDO JIP approach. Each participating nation is designated lead nation and CJFHQ twice during the LOE. All national staffs are presented with an operational situation disclosure and commander’s intent at the beginning of each vignette and tasked to develop a COA. During actual operations, a planning staff would develop several COAs, but to keep the LOE to a manageable size, only one COA is developed by each staff.

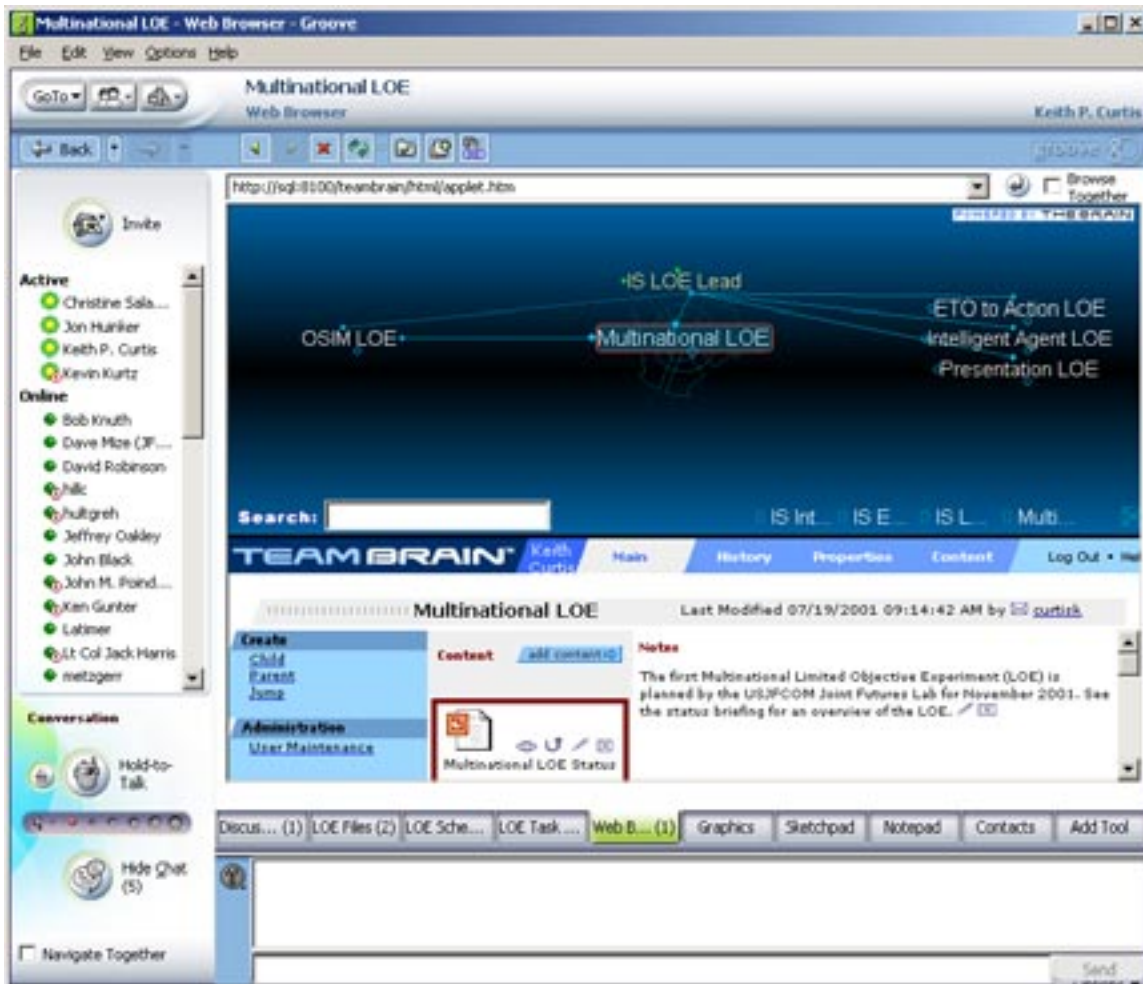


Figure 4. Groove Shared Space with Team Brain in Web Browser

The lead nation prepares an initial COA in response to the tasking and submits it to the coalition national staffs for iterative comment and approval. The lead nation then adjusts the COA as necessary and submits the final plan to the LOE control cell. The CJFHQ nation continuously interacts with the other national staffs and develops an agreed COA, which is submitted to the LOE control cell when consensus is reached among the national staffs. A panel of senior subject matter experts (SMEs) evaluates the COAs developed during each vignette. The SMEs evaluate the COA without knowing what approach was used and what nation was the lead nation or CJFHQ, since the intent is to evaluate the products produced by the processes and not staff planning ability. The SMEs also help define the commander's intent for each vignette so they are familiar with the vignette.

The planning staffs are comprised of individuals with military experience that includes operational planning and analysis. A notional staff has a leader, one or two planners, and one or two analysts. The staffs are kept intentionally small to keep personnel resource demands reasonable. When a staff is the lead nation or CJFHQ, the staff consists of a leader, two planners, and two analysts. When a staff is a reviewing staff for Lead Nation or collaborating staff for RDO JIP, the staff consists of a leader, one planner, and one analyst. When a nation is the lead nation, it is a collaborating nation for RDO JIP. When a nation is CJFHQ, it is a reviewing nation for Lead Nation. Thus for any vignette, a nation provides eight individuals if they are lead nation or CJFHQ and six individuals otherwise.

All national staffs have access to the collaboration tools, however the Lead Nation staffs can only use the tools after the initial COA is developed and distributed to coalition national staffs for iterative comment and approval. The scenario information resides in a Groove shared space for reference. Vignette disclosures and the associated commander's intent are also in shares space and available to all staffs. During a vignette, the RDO JIP staffs collaborate in a separate shared space. The Lead Nation staffs also have a separate shared space, but only for file transfer and formal communications.

Vignette shared spaces are closed to participants at the end of each vignette, and the information in the shared spaces is saved for post-LOE analysis. After each vignette, participants complete questionnaires located in a questionnaire shared space. The questionnaires are part of the data collected for post-LOE analysis. Figure 5 shows the Groove shared spaces in use during a vignette.

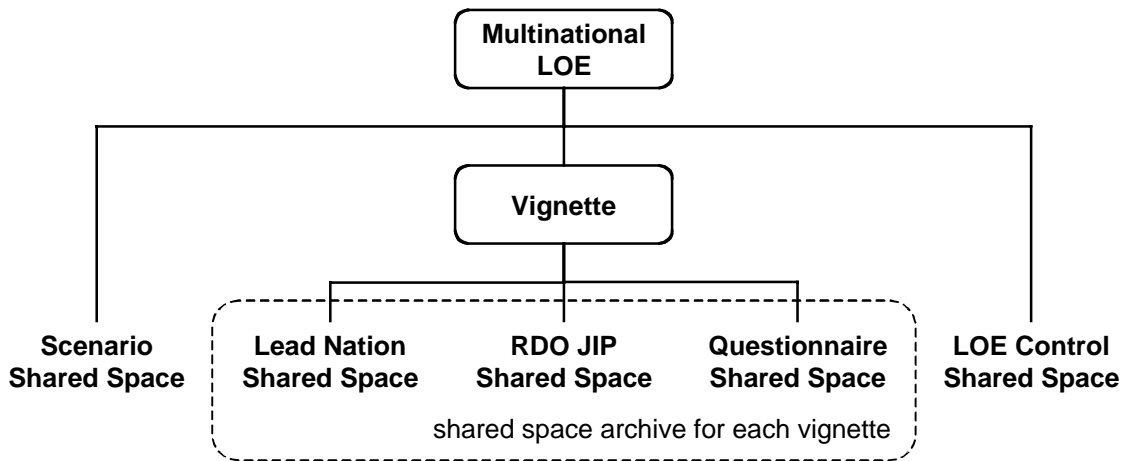


Figure 5. Groove Shared Spaces for Multinational LOE Vignettes

Vignette duration varies from six to twelve hours. The Lead Nation lead staff has some portion but not all of the vignette duration to develop the initial COA. The lead staff must allow sufficient time for coalition nations to comment and approve the COA so an agreed upon COA is produced. The RDO JIP staffs have all of the vignette duration to develop a COA and must also produce an agreed upon COA.

Measures of Effectiveness and Performance

Each COA is evaluated using three basic criteria: suitability, completeness, and accuracy. Suitability is determined by SMEs comparing the COA to the commander's intent and the operational situation presented in vignette disclosure. Completeness is determined by establishing how well the COA responded to the commander's intent and considered the information presented in the vignette disclosure. Accuracy is determined by comparing the information contained in the COA with the information available to the planning staffs. These criteria serve as the basis for accepting or rejecting the assertion that RDO JIP produces a superior plan when the planning time is short.

The Multinational LOE is an opportunity to collect valuable information on distributed collaborative planning. The most obvious comparison one can make is the amount of time needed to produce an agreed COA using the two processes. The time to produce a COA serves as the measure for accepting or rejecting the assertion that RDO JIP produces a sufficient plan faster. Other measures focus on items of interest such as the effect of network bandwidth and latency on the planning process.

Questionnaires completed by participants and automated information collection techniques provide the data for computing measures of effectiveness and performance.

Summary

This paper presents an approach for experimenting with multinational information sharing and collaboration. The goal is to establish a venue for exploring concepts and technologies that will permit coalition partners to plan and execute rapidly in the future. The experiments, known as LOEs, are intended to be both discovery events as well as structured experiments in partnership with nations that could become coalition partners with the United States in the future.

The U.S. Joint Forces Command Joint Futures Lab has developed the RDO Concept as a way to deal with future adversaries in an expeditious manner. It is unlikely that the U.S. forces would act unilaterally against an adversary, so it is important that the RDO Concept include provisions for coalition partners.

The key to successful RDO is a robust ONA, and the key to a robust ONA is shared awareness, collaboration, and a command and control organization tailored to the mission. The way towards developing a robust ONA must include experiments with potential coalition partners.

The Multinational LOEs are the first in a series of stepping stones towards understanding how to share information and collaborate with coalition partners effectively during RDO in the future when planning time is short, defining how coalition partners integrate into RDO Command and Control, and serving as pilot efforts to integrate coalition partners in OC04.

About the Author: Mr. Curtis is a principal operations research analyst with The MITRE Corporation, working at the United States Joint Forces Command Joint Futures Lab in Suffolk, Virginia. Over the last decade, Mr. Curtis has been heavily involved in the application of operations research techniques, modeling, and simulation to concept and system development. He currently concentrates on the design of experiments that explore new military concepts.