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THE ROLE OF THE COALITION WARRIOR INTEROPERABILITY DEMONSTRATION IN THE CANADIAN FORCES JOINT EXPERIMENTATION PROGRAM

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THE ROLE OF THE COALITION WARRIOR INTEROPERABILITY DEMONSTRATION IN THE CANADIAN FORCES JOINT EXPERIMENTATION PROGRAM

by
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Abstract

From its initial charter in 2001, the Canadian Forces Experimentation Centre (CFEC) inherited the responsibility for managing the Joint Warrior Interoperability Demonstration (JWID) program within Canada. With three years of experience coordinating JWID, while conducting a program of national and international experiments, it is timely to review the role of this event in CFEC's strategic plan, the Canadian Forces Joint Concept Development and Experimentation Plan (CF JCD&E Plan). This paper presents a strategy for integrating the JWID, renamed Coalition Warrior Interoperability Demonstration (CWID) in 2005, into the CF JCD&E Plan using two trials from the JWID in 2004 as case studies. These trials were sponsored by the Air Force and Defence Intelligence and used Defence Research and Development Canada (DRDC) technologies. The Portal-to-Portal Interoperability Trial used a situational awareness portal developed by the COP 21 (Common Operational Picture 21st Century) Technology Demonstration. The Collaborative Operations Planning System Trial tested a prototype for providing the ability to plan an operation in a net-enabled environment using integrated collaborative tools. This paper concludes with discussion of a strategy for using a program designed to trial and demonstrate technologies nearly ready for operational use in a Joint Concept Development and Experimentation program with a mandate to support transformation.

INTRODUCTION

The Canadian Forces Experimentation Centre (CFEC) is responsible for the development of the Canadian Forces Joint Concept Development and Experimentation Plan (CF JCD&E Plan) and for conducting Joint Concept Development and Experimentation in the Canadian Department of National Defence (DND). From its initial charter in 2001, CFEC inherited responsibility for managing the Joint Warrior Interoperability Demonstration (JWID) program, renamed Coalition Warrior Interoperability Demonstration (CWID) in 2005. This parallels the situation in the United States where the U.S. Joint Forces Command (USJFCOM) J9 Joint Experimentation took over the leadership of CWID this year. With three years of experience coordinating JWID while conducting a program of national and international experiments, it is timely to review the role of JWID, now CWID, in the CF JCD&E Plan.

In the 2004 JWID, Canada led a total five Coalition Interoperability Trials (CITs), sponsored either by the Air Force or by Defence Intelligence. Some of the technologies in these CITs were developed by Defence Research and Development Canada (DRDC); the agency in DND for Science and Technology (S&T). The two trials selected for

discussion in this paper are the Portal-to-Portal Interoperability Trial, sponsored by Defence Intelligence, and the Collaborative Operations Planning System (COPlanS) Trial, sponsored by the Air Force. Both used DRDC technologies intended to transform Canadian Forces processes. These trials were selected as case studies since both technologies had a broader role in Joint Experimentation in DND.

The Canadian technology in the Portal-to-Portal Interoperability Trial was a situational awareness (SA) portal developed by the Common Operating Picture in the 21st Century Technology Demonstration (COP 21 TD). This application was developed for use by the Canadian Forces Joint Staff and Joint Operations Group. After JWID 04, CFEC saw potential for the COP 21 Portal in Joint Forces Command's Multinational Experimentation (MNE) Series where CFEC had taken on the task of conducting a Limited Objective Experiment on Knowledge Management. The COP 21 Portal has since been acquired by CFEC for further experimentation.

COPlanS is an integrated suite of planning, decision-aid and workflow management tools designed to support collaboration by distributed military staff in the military planning process. An early prototype had been tested in JWID 03. Well in advance of JWID 04, this application had received support from CFEC to develop this tool to support Effects Based Planning in the MNE Series. To that end, CFEC encouraged and assisted in the funding for the COPlanS CIT. The JWID 04 trial, where members of the Canadian Forces Joint Staff and Joint Operation Group would be the primary warfighter audience, was seen as ideal for preparation for the next MNE.

The formal objective of future CWIDs is to demonstrate technologies that should be ready for operational use within a year. Not all of the technologies tested will be successful and so some will take longer. Some nations participating in CWID may decide to use the venue for promising technologies that could take longer anyway. This paper proposes that nations should consider using CWID not only for maturing technologies ready for operations, but also for maturing technologies that could be used in experimentation. While both of the technologies in these case studies were intended for operational use in the near term, CFEC's experimentation requirements justified a test and evaluation trial on COPlanS in 2004 and JWID provided an ideal opportunity. The COP 21 Portal was a product of DRDC's Technology Demonstration Program (TDP) and JWID 04 provided the final demonstration venue for this technology. In both of these cases, the JWID venue served other requirements beyond demonstrating technologies for operational use.

The next two sections will describe the JWID trials for Portal-to-Portal Interoperability Trial and COPlanS. The JWID assessment process was applied to all CITs. Therefore, a brief explanation of this process is required for background. Three types of assessments could be used to evaluate each JWID trial. The Warfighter/Operator Utility Assessment (or Warfighter Assessment as it is normally referred to) measured the technical performance of each trial in terms of stated objectives and capabilities in support of the overarching JWID objectives. The Interoperability Assessment evaluated the data exchanges between systems to ensure that the data transferred was received and processed correctly. The Security Assessment focused on how the trial counters threats and enforces policies consistent with the projected environment. In the discussions to follow, the results from the Warfighter Assessments will be presented. The data for this

assessment is collected during JWID execution by players completing network accessible questionnaires. These questionnaires are generated specifically for each trial based on trial objectives (mapped to the JWID objectives), trial capabilities, applicable measures of performance (MOPs) designed for each trial, and predefined scenario events and/or test schedules.

TRIALS IN THE 2004 JOINT WARRIOR INTEROPERABILITY DEMONSTRATION (JWID)

Portal-to-Portal Interoperability Trial (CIT 04.05)

Trial Background and Objectives

The Common Operating Picture in the 21st Century is a Technology Demonstrator led by DRDC Valcartier, aimed at improving the DND Command and Control (C2) situational awareness. More specifically, the COP 21 TD investigated how applying a systems architecture approach can help deliver knowledge management concepts and advanced visualization capabilities using portfolios in an enterprise level portal application. This application is called the Situational Awareness (SA) Portal.

The COP 21 TD utilizes a range of technologies that can only be adequately assessed by warfighters in a complex operational setting. JWID 04 provided a good venue for the major assessment event of the COP 21 TD. CIT 04.05 (Portal-to-Portal Interoperability) was designed to test as many aspects as possible of the portals and visualization technologies. This paper only addresses the observations made on the COP 21 Portal, Canada's contribution to the CIT.

The CIT 04.05 objectives were to assess the portals' capabilities for sharing applications hence information leading to enhanced situational awareness and to assess the visualization capabilities of six visualization applications. This involved assessing:

1. The portal's ability to help the users to:
    a. Discover, gather, filter, and view the appropriate information; and
    b. Gain situational awareness;
2. The interoperability of data sources and services with other portals by:
    a. Accessing other portals' information;
    b. Provision of COP 21 information to other portals; and
    c. Integrating web services from other organizations.

This trial supported the JWID Objective on ISR dissemination by attempting to connect together several portals in a distributed fashion. The portals involved implemented different approaches to provide each participating organization an opportunity to investigate design viewpoints and consider the interoperability implications these methodologies might pose.

Data Collection and Analysis Plan

The analysis plan developed for CIT 04.05 used three data collection methods to support the analysis:

1. Direct observation of players by the analysis team;
2. Player feedback through structured surveys; and
3. Quantitative analysis of portal data captured by an application event logger.

The Warfighter Assessment involved the analysis team monitoring and commenting on each event of the scenario event list. The main source of quantitative data came from a 45 question online survey. The information was collected twice, at the end of each week of execution. The CIT 04.05 assessment questions were generic so as to apply to CIT participants at all sites. The assessment was grouped into 3 broad areas; portal relevance to regular work, to JWID work, and to the JWID scenario.

Portal transaction data was collected in an event logger designed specifically for the COP 21 Portal. Key transactions were parsed into fields in a database using a simple analysis tool. Metrics and associated graphical displays were developed so the data could be converted into information about warfighter and system performance. The process and tools successfully demonstrated that portal transactions can be captured quantitatively, measured and assessed. The analysis of the transaction data is still in progress so none of the following results relate to this aspect of the analysis plan.

Analysis Results

The assessment involved 35 warfighters at 12 sites in 6 countries. The Canadian players were experienced operators trained in the Operational Planning Process (OPP) in roles in both operational and strategic level headquarters. The players outside Canada were a good cross-section of experienced Canadian and other coalition nation operators, plus a few civilians/contractors that have relevant experience working with the military. Engineering support for the trial was available at the main site in Ottawa, Canada and on-site training was conducted there during training week. All warfighters had access to a comprehensive on-line help file within the portal and the training plan called for the remainder of sites to be briefed using an online collaboration service.

The analysis determined that CIT 04.05 successfully supported the JWID Objective on ISR Dissemination as well as the JWID Objective on Database Fusion. It connected together several portals and shared portal applets within and between portals in a distributed fashion. The portals involved used various implementation approaches to provide each participating organization an opportunity to investigate design viewpoints and consider the interoperability implications these methodologies might pose. Ottawa participants felt training was marginal to good while other sites were critical about lack of training due to failures of the collaboration service during training week.

The warfighters believed the COP 21 Portal improved their situational awareness. This was accomplished by integrating military and commercial data in near real time using various tools available on the network. Applications involved included the Coalition Portal for Imagery and Geospatial Services (CPIGS), the Request For Information (RFI) manager, the Geospatial Information System (GIS) browser, and the COP 21

visualization tools as well as office automation tools combined in a single desktop. The portal was found to be successful at using existing services and other sources plus exploiting collaboration tools. The portal remained stable and fully available during numerous daily scenario events throughout the JWID. Players easily shared information with each other and other portals at several sites.

The COP 21 Portal employed a portfolio concept that worked very well at integrating and displaying a wide variety of information to support situational awareness. The portfolios tended, however, to become disorganized during each week of play. It was decided one player should have been assigned the role of content manager. The search tool, Autonomy, demonstrated the capability by being able to automatically find new relevant documents from across a wide range of unstructured sources using contextual searches. The GIS Browser worked properly after some integration issues were sorted out during the first week.

The following six visualization applications from the geospatial community were assessed:

1. Geoparsing and Retrieval of Indexed Documents (GRID) to search for geospatial locations within a document;
2. ORBAT / Infra Browser Display for information of military and non-military organizations plus information about critical infrastructures;
3. GeoServNet (GSN) to provide 3D View and analysis of open terrain and urban environments;
4. StrategicSight to provide 3D Visualization of Strategic level information;
5. Tarentella to emulate thick applications from Defence Threat Reduction Agency (DTRA); and
6. Battle Rhythm to allow for the synchronization of critical events of interest to multiple organizations.

The visualization portion of the trial was moderately successful in demonstrating the fusing of information from various data sources into a homogenized view of the situation. Each application was able to demonstrate its functionality within the portal but several required direct support from developers to make them function properly. The small number of scenario events and corresponding low number of observations led to the recommendation that the visualization capabilities need to be demonstrated again before conclusions are made about the operational utility of these applications.

The players gave the CIT 04.05 technologies a strong endorsement as a whole and commented very positively on the range and depth of functionality that was demonstrated. They also provided particularly positive feedback about the flexibility and utility of the portfolio, portal, and search functions. The warfighters made many positive, constructive suggestions about how to improve functionality, particularly about the user interface. The integration of applications and ease of access to them was also greatly appreciated.

Conclusions

It was concluded that CIT 04.05 (Portal-to-Portal Interoperability) achieved its two planned trial objectives. Sharing portal applications between portal systems was a success. The trial's target audience, warfighters supporting operations in headquarters, felt the trial demonstrated capabilities that could lead to major improvements in their ability to maintain situational awareness by providing "one-stop shopping" of integrated information. Although it took time for the players to become comfortable with the many capabilities integrated by portfolios, their confidence in the portal services increased quickly to the point where they soon considered it to be the preferred way to do business. The improved availability associated with on-site engineering support confirms the need to ensure adequate engineering support when fielding any sophisticated technology such as a portal. The demonstration of advanced visualization capabilities was more limited but was still considered successful given its stage of development.

Recommendations

The assessment recommended that the COP 21 Portal be fielded after modifications to take into account the new requirements proposed by the JWID 2004 players. The existing version of the portal and its services were deemed suitable as a core service for future experiments and demonstrations. It was recommended that the advanced visualization capabilities should be developed further and tested in future trials. The COP 21 Portal developers, the COP 21 TD, were encouraged to pursue a strategy that would field the existing portal as quickly as possible.

Collaborative Operations Planning System (COPlanS) (CIT 04.08)

Trial Background and Objectives

The COPlanS Trial (CIT 04.08), which also supported the JWID objective on ISR Dissemination, was based on a technology designed to provide the ability to plan an operation in a net-enabled environment using integrated collaborative tools. It is a flexible suite of planning, decision-aid, and workflow management tools capable of supporting a distributed team in the conduct of mission planning. It offers functions to design, manage and synchronize multiple concurrent battle rhythms at the strategic and operational levels, and to a limited extent at the tactical level. It can help synchronize the staff workflow, automatically document the decision-making process, and replay the decision-path. The planning tools help warfighters to sketch courses of action (COAs) on maps, to perform time and space synchronization, to manage resources and capabilities, to manage the order of battle (ORBAT) and to perform logistics analyses. The decision-aid tools help the staff to rationalize the planning process, to evaluate and compare the COAs, and to rapidly produce documents to support the Commander's decisions. COPlanS has collaborative tools including chat, white board and a map planner. A context sensitive search engine is also available to browse past similar operations and recall plans and lessons learned from the database.

The objectives of the COPlanS trial were [Ref 1]:

1. To demonstrate and evaluate COPlanS as a multi-level workflow management system, a distributed OPP collaborative planning system, a decision support system, and as an information broadcasting system; and
2. Within the JWID environment:
    i. to support distributed planning by multiple headquarters engaged in multiple operations at the operational level;
    ii. to allow coalition HQs to collaborate from different sites; and
    iii. to allow reach back to different sites and support automatic dissemination of properly formatted information (i.e. Operation Orders, Operation Plans).

The trial was a small experiment to test the following detailed hypothesis [Ref 1]:

If COPlanS is employed by multiple HQs in a net-enabled operations environment, then geographically distributed staff officers will be able to:

- *Maintain staff synchronisation while executing the different OPP activities and maintain near-real time staff updating on new information thereby improving situation awareness as well as the tempo and quality of the decision-making;*
- *Perform distributed mission analysis in a structured and rational manner thereby improving the quality of the staff assessment and the information brief (when combined with the COP 21 Portal);*
- *Perform distributed full scale COA development, analysis and evaluation thereby supporting distributed collaborative planning and manual war gaming to improve the COA quality;*
- *Perform distributed COAs comparison and produce an online decision-briefing thereby rationalizing the decision-making process and improving the decision quality; and*
- *Replay the decision path and thereby support organisation memory (automatically document processes and decisions).*

Data Collection and Analysis Plan

The analysis plan for CIT 04.08 was based on the first two of the three collection methods employed for CIT 04.05; direct observation of players by the analysis team and player feedback through structured surveys. The data collection was designed based upon metrics identified from the experiment hypothesis and the capabilities of the technologies under trial. The trial attempted to quantify these metrics, however, data collection in this experiment was limited and some estimates and approximations were employed.

Questionnaires were used to determine the level of staff synchronisation during the execution of different planning activities. The latency time on new information (as perceived by the staff officer) was to be estimated by observation. Observers and questionnaires were used to determine the level of situational awareness of the participants and questionnaires were used to detemine if COPlanS had a positive impact on the tempo and quality of the decision making.

Both questionnaires and observations were used in order to characterize the distributed mission analysis activity process in terms of structure and rational and to assess the quality of the staff assessment and quality of the information brief. Players were also

questioned on the requirements for distributed full scale course of action (COA) analysis, the effectiveness of COPlanS for distributed collaborative planning and COA comparison, the quality of the COA produced in the trial, and the production of the online decision briefings using COPlanS. Observations and questionnaires were both used to estimate the improvement to the decision-making process and decision quality in this trial.

As JWID is a warfighter test, evaluation and experimentation venue for technology validation, the data collection is designed primarily for the collection of warfighter feedback. Surveys typically employ a series of questions about each technology function or capability, which were linked to the metrics for CIT 04.08. The evaluation of the functions or capabilities is based upon the warfighter reactions stimulated by the events in the scenario while using the technology. Consequently, seven-point agree (also known as Lickert) scales were used extensively in the surveys. The following questionnaire was developed to collect warfighter feedback on the COPlanS functions described in the hypothesis and objectives.

General:

1. In general, distributed collaboration is useful for conducting the operational planning process (OPP) collectively. (Agree Scale)
2. In general, the operational planning process (OPP) provided in COPlanS corresponds to my understanding of that process. (Agree Scale)

Synchronization and Situational Awareness:

3. Situation awareness within our group was improved using COPlanS compared to existing tools. (Agree Scale)
4. The synchronization of the staff was improved using COPlanS to execute OPP activities compared to existing tools. (Agree Scale)
5. COPlanS improved the tempo of the decision making within my group. (Agree Scale)
6. COPlanS improved the quality of the decision making within my group. (Agree Scale)

Distributed Mission Analysis:

7. COPlanS supported the distributed mission analysis activity effectively. (Agree Scale)
8. COPlanS helped to improve the quality of the staff assessment and the information brief. (Agree Scale)

Full Scale COA Development:

9. Is COPlanS a suitable tool to perform distributed full scale COA development, analysis and evaluation? (Yes/No) If not please explain.
10. COPlanS allowed me to collaborate effectively in planning activities with the national and coalition partners at other sites. (Agree Scale)
11. Did COPlanS improve the quality of the COAs? (Yes/No)

COA Comparison, Brief and Decision:

12. COPlanS was effective in supporting COAs comparison in a distributed environment. (Agree Scale)

13. COPlanS was effective in supporting the production of an online decision briefing. (Agree Scale)
14. COPlanS helps structure and improve the process for deciding on a COA. (Agree Scale)

There are practical limits to the questions that can be addressed through survey questionnaires and to the level of effort requested from the players. Observers were therefore tasked to comment on several questions plus a number of key issues. These are included in the full data collection plan for the trial which is described at Ref 2.

Analysis Results

COPlanS was employed primarily in conjunction with two other CITs: CIT 02.18 Canadian Air Tasking Order / Airspace Control Order (ATO/ACO) XML Interpreter (CAAT-Xi) and CIT 04.05 (Portal-to-Portal Interoperability). (CIT 02.18 was an application designed to provide operators with the capability to display US or NATO generated ATO and ACO data in a graphical and tabular format.) COPlanS and the COP 21 Portal were used to support warfighters playing roles in a Joint Headquarters and roles as Air Force mission planners. The assessment involved 19 players at 7 sites in 5 countries. The majority of the Joint players were operators assigned to Joint units. The Air Force players were a mixture of operators and staff employed in technical support positions. The group was evenly mixed between Joint and Air Force, but largely Canadian. Most of the players were very experienced military staff familiar with operations or operational requirements.

As a tool that supports a distributed mission planning team through distributed collaborative analysis and planning, within and across coalition and inter-agency information domains, COPlanS was found to be effective and improve the quality of the staff assessment and the information brief. In this trial, COPlanS primarily enhanced the sharing of ISR products as the scenario was not well suited for testing the dissemination of planning products. In terms of improving team synchronization and situational awareness, the assessment findings indicated that COPlanS improved situational awareness compared to existing tools as well as synchronization in the planning process. While COPlanS was not seen to improve the tempo of the planning process in this trial, it was judged to provide some improvement in the quality of decisions.

As a tool for COA development, the players felt that COPlanS did not improve COA quality in this trial and that it had little impact on their ability to collaborate effectively in COA planning with staff at other sites. This may have been a consequence of having insufficient time for mission planning within the scenario events schedule. They did feel, however, that it was a suitable tool for COA development, analysis and evaluation in a distributed environment. As a tool that supports COA selection (the decision making process), the players indicated clearly that COPlanS helped structure and improve the process of selecting a COA. They also felt that COPlanS was useful for comparing COAs in a distributed environment and effective in the online production of a decision brief.

The assessment showed that warfighters had a wide range of reactions to this CIT. Some felt the tool was too complex for their needs while others were quite enthusiastic at the potential capability. There was dissatisfaction with the training, the scenario, and the time

available to conduct planning activities with the tool. Some of the Joint players provided specific comments about the suitability of the interface and ways to make the tool more usable. The assessment results showed that on average the players approved of this new technology, but wanted to see more development before it is fielded.

Conclusions

The COPlanS technology is still developing and JWID 04 provided a valuable trial opportunity in which to gather warfighter feedback on the capabilities in a distributed environment. The overall feedback was positive indicating that this technology performed well in the trial and therefore should be useful to the warfighter. Considerable constructive criticism was collected and it is clear that there should be more development to prepare this tool for operational use. Comments were received that COPlanS should be trialed in a different scenario with more time available for mission planning. It was also clear that players require significant training in preparation for trials using such a complex tool.

Recommendations

COPlanS should be considered for operational employment after some further development. The development should include improvements to the user interface and to the collaboration services. Plans should be made for future trials that employ a more suitable scenario for mission planning and provide more time to conduct planning and the opportunity to test effectiveness of the tool in the dissemination of the products.

STRATEGY FOR INTEGRATION INTO THE CF JCD&E PLAN

The preceding case studies will now be considered in terms of the strategic plan for Joint Experimentation in the Canadian Forces. The Canadian Forces Experimentation Centre was established with the specific mission to lead the exploration and evaluation of emerging concepts to determine the capabilities required by the DND/CF in the future. CFEC sponsors or champions activities (concept development, experimentation, and modeling and simulation) that relate directly to the accomplishment of this mission. With this in mind, CFEC has the following mission statement:

> *As the Centre of Excellence for Joint CD&E, CFEC will lead the exploration of emerging concepts and the experimentation of capabilities that support CF transformation.*

Plan Pegasus 04 is the CF's strategic plan that details intended Joint Concept Development & Experimentation activity for the coming year and outlines intentions for the next several years. It outlines the major concepts under development at CFEC in the areas of *Command and Control* (C2)*, Information and Intelligence* (I2)*,* and *Sustainment*. Within the C2 program, the concepts relate to interoperability issues associated with operations within a framework that is joint, inter-agency, multinational and public. Interoperability across these categories should occur in three domains [Ref 3]:

- Information interoperability, the way we share information including technological and procedural aspects;

- Cognitive interoperability, the way we perceive and think reflected in doctrine and decision processes; and
- Behavioural interoperability, the way we carry out the selected course of action.

CFEC's C2 experimentation objectives are to investigate Command and Control interoperability issues at the operational level and both internally and with external security partners. This will lead to recommendations for concept implementation strategies to achieve effective and efficient employment of military capabilities through controlled scientific investigation. As stated in *Plan Pegasus 04* [Ref 3]:

> *"If the CF is to remain interoperable with the transforming organizations within the US and other close allies, then we must understand fundamental transformational concepts and implementation strategies within their organizations and their associated interoperability implications, and appropriately modify selected concepts and their implementation strategy for Canadian adoption."*

Within the timeframe of *Plan Pegasus 04*, the CFEC's C2 experimentation campaign plan will focus on national involvement in multinational events such as the MNE series, JWID 04, and the CWID series starting in 2005. The JWID/CWID series focus on near term (one to five years) concepts and implementation strategies associated with information sharing and collaboration while the MNE series investigates near to mid term (five to ten years) concepts and implementation strategies for Effects Based Approaches to Security and Defence within a multinational coalition. These activities are seen to facilitate the investigation of interoperability issues associated with the requirement for military operations conducted within a framework that is joint, inter-agency, multinational and public.

The challenge is to provide validated concepts through integrated analysis and experimentation exploiting modeling and simulation as much as possible. The United States Joint Forces Command J9, Joint Experimentation, uses two pathways: a Concept Development pathway and a Prototype pathway [Ref 4]. The concept pathway uses a series of events with the overarching objective of developing a shared vision through collaboration with the combatant commanders, the services and USJFCOM. USJFCOM refers to this as the "common joint context". The common joint context is used to create a common joint experimentation environment through integrating events that take the knowledge acquired from service games (exploring the common joint context) into a joint environment. The service events shape the capabilities while the joint events integrate the capabilities.

It is very important, from USJFCOM's point of view, to bring as many experts as possible into the concept development stage to ensure truly joint functionality across command and services. The best ideas from the concept pathway are used on the prototype pathway where products and capabilities are developed to support validated concepts. Products on the prototype pathway are developed and tested through an experimentation process with input from senior officials from the various armed services, USJFCOM and defence leaders.

Like USJFCOM, CFEC needs both concept development and prototyping venues to evolve the products associated with concept development. It is acknowledged within the MNE community, that although the events in this series are part of J9's prototype pathway, they are generally concept development opportunities for the other nations. It is therefore proposed that CWID, an environment traditionally for prototypes about to be taken into operational use, could also be suitable for prototype products from concept development environments.

CONCLUSION

The case studies presented in this paper describe the successful trials of two technologies that have potential for concept development experiments. The COP 21 Portal was tested in JWID 04 as part of the evolution of DRDC's Technology Demonstration Program. It was very successful in that demonstration and provided a capability for net-centric operations for an operational level headquarters. CFEC subsequently considered using the COP 21 Portal in their Knowledge Management experimentation for MNE 4. COPlanS, a tool that supports the mission planning process, was proposed by Canada in June 2003 for use in MNE 3 with consideration for employment in MNE 4 as well. The reconfigurable features of this application allow it to be applied to any planning process: traditional operational planning or the planning for missions in Effects Based Operations.

JWID 04 provided the ideal testing environment for tools that could be used in a joint operational headquarters relying on distributed collaboration to conduct mission planning or operations. Subsequent to a successful concept development experiment, tools should be trialed in CWID again for validation prior to integration into operational systems. CIT 04.05 showed that the collection of transaction data for subsequent detailed analysis has significant potential; this should be developed further.

CWID provides opportunities for exposing prototypes to the operational community, however, there are limitations. No single event can meet all the requirements of the CD&E community. Likewise, both pathways are needed to produce well-rounded concepts and tools. CWID can support experiments like MNE4 and in turn applications that show well in events like MNE4 can be re-trialed in CWID before being put into operational use. With careful planning, these venues can be used iteratively to progress CD&E in the joint environment.

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