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Supporting documents are attached to the report as separate files (MS Word, HTML, PDF).

14. ABSTRACT

The Framework for Semantic Interoperability covers NATO needs for semantic correct interoperability among coalitions. Knowledge based mechanisms and policies are needed to flexibly bridge semantic gaps. These gaps have to be addressed, because a harmonization of systems or a stabile situation after a harmonization is an illusion due to technical innovations and system evolvements that cannot be globally synchronized. Also an identical understanding of exchanged information at human sender and receiver cannot be taken for granted. To achieve the premises for NNEC (NEC, NCW, CROP) means to guarantee that the meaning of exchanged data and the purpose of the information exchange must be preserved.

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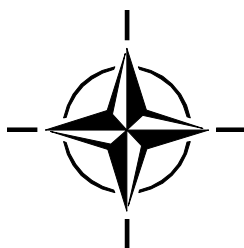AC/323(IST-097)TP/425

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RTO MEETING PROCEEDINGS **MP-IST-097**

Semantic Interoperability Framework

(Cadre de l'Interopérabilité Sémantique)

Papers presented at the RTO Information Systems Technology Panel (IST)
Workshop held in Oslo, Norway on 8–9 November 2011.

Published November 2011

The Research and Technology Organisation (RTO) of NATO

RTO is the single focus in NATO for Defence Research and Technology activities. Its mission is to conduct and promote co-operative research and information exchange. The objective is to support the development and effective use of national defence research and technology and to meet the military needs of the Alliance, to maintain a technological lead, and to provide advice to NATO and national decision makers. The RTO performs its mission with the support of an extensive network of national experts. It also ensures effective co-ordination with other NATO bodies involved in R&T activities.

RTO reports both to the Military Committee of NATO and to the Conference of National Armament Directors. It comprises a Research and Technology Board (RTB) as the highest level of national representation and the Research and Technology Agency (RTA), a dedicated staff with its headquarters in Neuilly, near Paris, France. In order to facilitate contacts with the military users and other NATO activities, a small part of the RTA staff is located in NATO Headquarters in Brussels. The Brussels staff also co-ordinates RTO's co-operation with nations in Middle and Eastern Europe, to which RTO attaches particular importance especially as working together in the field of research is one of the more promising areas of co-operation.

The total spectrum of R&T activities is covered by the following 7 bodies:

- AVT   Applied Vehicle Technology Panel
- HFM   Human Factors and Medicine Panel
- IST   Information Systems Technology Panel
- NMSG   NATO Modelling and Simulation Group
- SAS   System Analysis and Studies Panel
- SCI   Systems Concepts and Integration Panel
- SET   Sensors and Electronics Technology Panel

These bodies are made up of national representatives as well as generally recognised 'world class' scientists. They also provide a communication link to military users and other NATO bodies. RTO's scientific and technological work is carried out by Technical Teams, created for specific activities and with a specific duration. Such Technical Teams can organise workshops, symposia, field trials, lecture series and training courses. An important function of these Technical Teams is to ensure the continuity of the expert networks.

RTO builds upon earlier co-operation in defence research and technology as set-up under the Advisory Group for Aerospace Research and Development (AGARD) and the Defence Research Group (DRG). AGARD and the DRG share common roots in that they were both established at the initiative of Dr Theodore von Kármán, a leading aerospace scientist, who early on recognised the importance of scientific support for the Allied Armed Forces. RTO is capitalising on these common roots in order to provide the Alliance and the NATO nations with a strong scientific and technological basis that will guarantee a solid base for the future.

Semantic Interoperability Framework
(RTO-MP-IST-097)

Executive Summary

INTRODUCTION

Information superiority is one of the primary issues for NATO Network Enabled Capability (NNEC). It builds on the idea of a common information space where all participating elements and organizations have the opportunity to supply and retrieve information according to their particular roles in the operation. Future C4I systems must be capable of accessing, 'understanding', and utilizing the information content within this space. Information must be conveyed in a secure and trusted way. This includes the idea that the meaning of the information and the purpose of the information exchange are understood and interpreted identically everywhere and at all times. This level of understanding between all elements participating in joint/combined operations requires a broad attention to the context of information and the concepts contained within the information. True understanding of the concepts within the information can be equated to understanding the semantics of the information.

The vital need for Semantic Interoperability has been repeatedly recognized and some related projects have been set up but, on one hand, further research is still required and, on the other hand, Semantic Interoperability still needs dissemination and must be brought to the attention of decision makers at all decision levels.

WORKSHOP

The RTG IST-094 on "Semantic Interoperability", which organized the 1.5 day Workshop subsequent to the Symposium on "Domain-Based and Semantic Interoperability", has developed a Framework (Semantic Interoperability Logical Framework – SILF) that supports the mediation of information exchanged between heterogeneous C2 systems and guarantees that this information aligns to the semantic concepts of the target system and the context of the task. The RTG presented the architectural concepts of SILF, the mediation functionality as well as a concept for a centralized repository that provides the mediation resources.

Two prototypes implemented by two companies were demonstrated and provided the first proof of concept for SILF.

In three parallel tracks the interested community discussed the concepts and several useful suggestions for both technical improvements and for operational premises (e.g., use cases) necessary for a deployment of a mediation solution were presented.

Cadre d'interopérabilité sémantique
(RTO-MP-IST-097)

Synthèse

INTRODUCTION

La supériorité en matière d'information constitue une des questions majeures pour la Capacité en réseau de l'OTAN (NNEC). Elle s'appuie sur le concept d'un espace d'information commun où toutes les parties et organisations participantes ont la possibilité de fournir et de retirer des informations en fonction de leurs rôles particuliers dans l'opération. Les futurs systèmes C4I doivent être capables d'atteindre, de ‹ comprendre ›, et d'utiliser le contenu des informations situées dans cet espace. Les informations doivent être transmises par un moyen sûr et sécurisé. Cela suppose que la signification des informations et l'objectif de l'échange d'informations sont compris et interprétés de manière identique, en tout lieu et à tout moment. Ce niveau de compréhension entre tous les membres participants engagés dans des opérations interarmées/multinationales nécessite qu'on accorde un maximum d'attention au contexte des informations et aux concepts inclus dans les informations. Une réelle compréhension de ces concepts peut être assimilée à une compréhension de la sémantique de l'information.

La nécessité vitale d'interopérabilité sémantique a été reconnue à maintes reprises et quelques projets de référence ont été créés mais d'une part, des recherches approfondies s'avèrent nécessaires et d'autre part, le concept d'interopérabilité sémantique a encore besoin d'être répandu et doit notamment être porté à la connaissance des décideurs à tous les niveaux de prise de décision.

ATELIER

Le RTG IST-094 sur « L'interopérabilité sémantique », qui a organisé l'atelier sur un jour et demi à la suite du symposium relatif à « L'interopérabilité sémantique et basée sur les domaines », a développé un cadre (Cadre Logique d'Interopérabilité Sémantique – CLIS) qui soutient la médiation d'informations échangées entre les systèmes hétérogènes C2 et qui garantit que ces informations s'alignent sur les concepts sémantiques du système cible et sur le contexte de la mission. Le RTG a présenté les concepts architecturaux du CLIS, la fonctionnalité de la médiation ainsi qu'un concept de référentiel centralisé qui fournit les ressources de la médiation.

La démonstration de deux prototypes mis au point par deux sociétés a été effectuée et a fourni la première validation du concept de CLIS.

La communauté concernée a discuté des concepts en suivant trois pistes parallèles, et plusieurs suggestions ont été présentées, concernant à la fois les améliorations techniques et les locaux opérationnels (cas d'utilisation) nécessaires au déploiement d'une solution de médiation.