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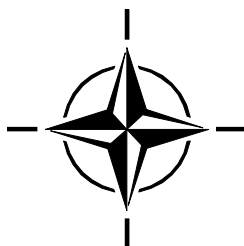
**RTO TECHNICAL REPORT**

**TR-MSG-068**

# **NATO Education and Training Network**

(Réseau OTAN de formation et d'entraînement)

Final Report of Task Group MSG-068.



Published February 2012

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**RTO TECHNICAL REPORT**

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# **NATO Education and Training Network**

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Final Report of Task Group MSG-068.

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# 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.

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## List of Acronyms

AAR	After Action Review
ACT	Allied Command Transformation
Bi-SC	Bi-Strategic Command (ACO & ACT)
C2	Command and Control
CAX	Computer Assisted Exercise – A means of using computer simulations and models in support of exercises
CCB	Configuration Control Board
CeAG	Certification Advisory Group
CFBLNet	Combined Federated Battle Laboratories Network
CIS	Communications and Information Systems
CJTF	Combined Joint Task Force
CP	Capability Package
DJTF	Deployed Joint Task Force
DSEEP	Distributed Simulation Engineering and Execution Process
EXCON	Exercise Control
EXPLAN	Exercise Plan
EXSPEC	Exercise Specification
FAC	Forward Air Controller
FAD	Federation Agreements Document
FAFD	Federation Agreements and FOM reference Document
FEDEP	Federation Development and Execution Process
FOM	Federation Object Model (HLA)
HLA	High Level Architecture
ICC	Integrated Command and Control software for air operations
IP	Integrated Project
IPC	Initial Planning Conference
ISAF	International Security Assistance Force
JALLC	Joint Allied Lessons Learned Centre
JCATS	Joint Conflict and Tactical Simulation
JCOP	Joint Common Operational Picture
JEC	Joint Exercise Control
JEMM	Joint Exercise Management Module
JEST	Joint Exercise Scenario Tool
JFTC	Joint Forces Training Centre
JMRM	Joint Multi-Resolution Model
JTLS	Joint Theatre Level Simulation
JWC	Joint Warfare Centre
LVC	Live, Virtual and Constructive
MEL/MIL	Main Event List / Master Incident List
MRE	Mission Rehearsal Exercise



MS	Mission Secret
MS3	Modelling and Simulation Standards Subgroup
M&S	Modelling and Simulation
NC3A	NATO Consultancy Command Control Agency
NCSA	NATO CIS Support Agency
NETN	NATO Education and Training Network
NGCS	NATO General purpose segment Communications System
NLVC	NATO LVC
NMSG	NATO Modelling and Simulation Group
NRF	NATO Response Forces
NS	NATO Secret
NSRL	NATO Simulation Resource Library
NTF	NATO Training Federation
OCE	Officer Conducting the Exercise
ODE	Officer Directing the Exercise
OP	Operational Planning
OPP	Operational Planning Process
ORBAT	Order of Battle
OSE	Officer Specifying the Exercise
OT	Observer Trainer
POW	Program Of Work
RC	Response Cell
RTA	Research and Technology Agency
RTI	Runtime Infrastructure
RTO	Research and Technology Organisation
SACT	Supreme Allied Command for Transformation
SISO	Simulation Interoperability Standards Organization
STANAG	Standardization Agreement
SW	Software
TA	Training Audience
TOR	Terms Of Reference
UAV	Unmanned Aerial Vehicle
VV&A	Verification, Validation and Accreditation
WG	Working Group

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# NATO Education and Training Network

## (RTO-TR-MSG-068)

### Executive Summary

In recognition of current and anticipated operations, NATO established the need for, and initiated development of, a distributed and networked education and training capability subsequently titled the NATO Education and Training Network (NETN). NETN originated to integrate and enhance existing national capabilities and focus on the education and training of NATO Operational and Tactical Headquarters' staffs and NATO forces preparing to execute NATO Response Force (NRF), Combined Joint Task Force (CJTF), International Security and Assistance Force (ISAF) and other future NATO missions. For these missions NATO provides and trains combined headquarters, and Nations assign trained tactical forces. Therefore, the training of the combined headquarters is the responsibility of NATO while Nations are responsible for the tactical training of the assigned forces. An NETN consisting of a persistent infrastructure, distributed training and education tools, and standard operating procedures not only supports the training of NATO headquarters but also enables the Nations to collaborate with each other to train their tactical forces and headquarters. NETN promises a more efficient and less costly capability for these purposes, and broader and deeper interoperability. Moreover, it also introduces an opportunity to integrate the training of NATO headquarters (i.e., both technically and procedurally) with the tactical forces when needed for short notice mobile mission rehearsal training and other integrated exercise requirements.

Current and emerging operational requirements increase the need for a highly available, agile, flexible and cost-effective NETN. Existing capabilities such as the NATO Airborne Early Warning and Control (AEW&C) and enhanced capabilities such as Unmanned Aerial Vehicle, Joint Intelligence, Surveillance and Reconnaissance capabilities, Friendly Force Trackers, C-IED, and Cyber Defence are being integrated into ISAF and the NRF operations and preparations. New capabilities such as the Air Command and Control Systems (ACCS), Airborne Ground Surveillance (AGS) and Active Layer Theatre Ballistic Missile Defence (ALTBMD) are also in development. Additionally, NATO is increasingly operating alongside non-NATO military as well as Non-Governmental Organizations (NGO), placing additional demands on current NATO tactics, techniques, and procedures. This combination of enhanced capabilities and evolving operational requirements are imposing new training requirements. For these reasons there is an essential need for a common NATO training and education distributed environment to boost standardization and interoperability, and at the same time to reduce duplication of effort and to enhance the efficient use of resources.

To meet this operational demand, Allied Command Transformation (ACT) requested that NATO Modelling and Simulation Group (NMSG) start a technical activity in 2006. NMSG tasked an Exploratory Team (ET-025) to analyze the requirement and start a technical activity. ET-025 formed Modelling and Simulation Group 068 (MSG-068 NETN) for this purpose in 2007. NATO Joint Warfare Center assigned the chair for MSG-068. Apart from NATO JWC, Headquarter Supreme Allied Command Transformation (HQ-SACT), Joint Forces Training Center (JFTC), NATO Consultancy, Command and Control Agency (NC3A) and 13 Nations (Australia, Bulgaria, France, Germany, Hungary, Netherlands, Romania, Slovenia, Spain, Sweden, Turkey, UK, USA) supported MSG-068. The MSG-068 NETN Task Group (TG) assessed the distributed simulation and learning capabilities that could contribute to the development of an NETN capability. The Task Group (TG) recommends and demonstrates a way forward for interoperability, technical standards and architectures to link the NATO and national training and education centres to provide a persistent capability, and also identifies and recommends roles and responsibilities of the NATO, Partner and Contact Nation organizations within the scope of NETN.

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MSG-068 recommendations need to be implemented by NATO and the Nations to achieve the NETN vision. MSG-068 recommends either a new capability package or an amendment to an existing capability package to act on the recommendations.



# Réseau OTAN de formation et d'entraînement

## (RTO-TR-MSG-068)

### Synthèse

A la lumière d'enseignements tirés des opérations en cours et anticipées, l'OTAN a établi qu'une capacité de formation et d'entraînement distribuée et en réseau était nécessaire et a commencé à la développer, sous le nom de Réseau OTAN de formation et d'entraînement (NETN). Le NETN a été conçu pour intégrer et améliorer les capacités nationales existantes et se concentrer sur l'éducation et l'entraînement des personnels des états-majors opérationnels et tactiques de l'OTAN et des forces de l'OTAN se préparant à assurer une mission de force d'intervention de l'OTAN (NRF), de groupement de forces interarmées multinationales (CJTF), de force internationale de sécurité et d'assistance (ISAF) et d'autres futures missions de l'OTAN. Pour ces missions, l'OTAN fournit et entraîne des états-majors interalliés et les nations affectent des forces tactiques entraînées. Par conséquent, l'entraînement des états-majors interalliés est la responsabilité de l'OTAN tandis que les nations sont responsables de l'entraînement tactique des forces affectées. Un NETN, composé d'une infrastructure permanente, d'outils d'entraînement et d'éducation répartis et d'instructions permanentes ne soutient pas seulement l'entraînement des états-majors de l'OTAN, mais permet également aux nations de collaborer entre elles pour entraîner leurs forces et états-majors tactiques. Le NETN laisse envisager une capacité plus efficace et moins coûteuse dans ce but et une interopérabilité plus vaste et plus approfondie. Qui plus est, il donne l'occasion d'intégrer l'entraînement des états-majors de l'OTAN (c'est-à-dire, techniquement et sur le plan procédural) avec les forces tactiques si nécessaire pour une mission projetée à court préavis et pour d'autres besoins d'exercices intégrés.

Les besoins opérationnels actuels et nouveaux accroissent la nécessité d'un NETN très disponible, agile, souple et économique. Les capacités existantes telles que le système aéroporté de contrôle et d'alerte avancée OTAN (AEW&C) et les capacités améliorées telles qu'un véhicule aérien sans pilote, le renseignement interarmées, les capacités de surveillance et de reconnaissance, les systèmes de localisation de forces amies, la lutte contre les IED et la cyber défense sont intégrés dans les opérations et préparations de l'ISAF et de la NRF. De nouvelles capacités telles que le système de commandement et de contrôle aériens (ACCS), la surveillance du sol aéroportée (AGS) et la défense multicouche active contre les missiles balistiques de théâtre (ALTBMD) sont également en cours de développement. De plus, l'OTAN opère de plus en plus aux côtés de militaires non membres de l'OTAN ainsi que d'organisations non gouvernementales (NGO), ce qui ajoute des exigences vis-à-vis des tactiques, techniques et procédures actuelles de l'OTAN. Cette combinaison de capacités améliorées et de besoins opérationnels changeants impose de nouveaux besoins d'entraînement. Pour ces raisons, un environnement commun d'entraînement et d'éducation réparti est nécessaire à l'OTAN afin de stimuler la standardisation et l'interopérabilité et en même temps réduire la répétition inutile d'efforts et améliorer l'utilisation efficace des ressources.

Pour répondre à cette demande opérationnelle, le Commandement allié Transformation (ACT) a demandé que le Groupe OTAN sur la modélisation et la simulation (NMSG) débute une activité technique en 2006. Le NMSG a chargé une équipe exploratoire (ET-025) d'analyser le besoin et de commencer une activité technique. Dans cet objectif, l'ET-025 a formé, en 2007, le Groupe de modélisation et simulation 068 (MSG-068 NETN). Le Centre de guerre interarmées (JWC) de l'OTAN a nommé le président du MSG-068. Outre le JWC de l'OTAN, l'état-major du Commandement suprême allié Transformation (HQ-SACT), le Centre d'entraînement des forces interarmées (JFTC), l'Agence de consultation, de commandement et de contrôle de l'OTAN (NC3A) et 13 nations (Australie, Bulgarie, France, Allemagne, Hongrie, Pays-Bas, Roumanie, Slovénie, Espagne, Suède, Turquie, Royaume-Uni, Etats-Unis) ont soutenu le MSG-068.

Le groupe de travail NETN du MSG-068 a évalué les capacités d'apprentissage et de simulation réparties qui pouvaient contribuer au développement d'une capacité NETN. Le groupe de travail recommande et ouvre la voie vers des normes techniques et d'interopérabilité et des architectures pour relier les centres d'entraînement et d'éducation nationaux et ceux de l'OTAN afin de fournir une capacité durable ; il identifie et recommande les rôles et responsabilités de l'OTAN, des organisations nationales partenaires et de contact dans le champ d'application du NETN.

Les recommandations du MSG-068 doivent être mises en application par l'OTAN et les nations pour réaliser la vision du NETN. Le MSG-068 recommande soit un ensemble de nouvelles capacités, soit la modification d'un ensemble existant pour suivre les recommandations.

## NATO EDUCATION AND TRAINING NETWORK

### 1.0 INTRODUCTION

In the light of future operations and real-life challenges, NATO is recognising the need for development of a distributed and networked education and training capability which will integrate and enhance existing national capabilities and will focus on the education and training of NATO Operational and Tactical Headquarters' staffs and NATO forces preparing to execute NATO Response Force (NRF), Combined Joint Task Force (CJTF) and International Security and Assistance Force (ISAF) and any other future NATO missions.

To meet this operational demand, NATO Allied Command Transformation (ACT) established a vision to:

**Deliver to Alliance and Partners a persistent, distributed education and training capability able to support training spanning from strategic down to tactical level across the full spectrum of operations, leveraging national expertise and capabilities.**

ACT initiated the NATO Snow Leopard program to accomplish this vision. Snow Leopard is synonymous with NETN. NATO Snow Leopard is composed of the following components:

- Education;
- Shared scenarios; and
- Modelling & Simulation (M&S) toolsets.

All of them distributed over NATO Wide Area Network (WAN).

The WAN includes but is not limited to NGCS (NATO General Purpose Communication System). The Joint Warfare Centre (JWC) and Joint Forces Training Centre (JFTC) provide the backbone infrastructure by hosting the core services and functionality for each NATO Snow Leopard component. JWC and JFTC core capability must be easily extendable and reconfigurable to reach and provide services to NATO HQs, Centres Of Excellence (COE), NATO Schools, governmental and non-governmental agencies and appropriate national centres, ranges, or virtual simulators, depending upon exercise specifications and National needs and desires. NATO Snow Leopard instituted a common set of standards, protocols, interface middleware and procedures for M&S, C4ISR and live systems integration. These establish the foundation for NATO-wide interoperability and reuse in the training and education domain. The education component capitalizes on the latest web enabled technologies for Advance Distributed Learning (ADL). A scenario management framework allows rapid scenario generation and sharing in a collaborative environment while enforcing version control, user access rights and retrieve and storage mechanisms.

NATO Snow Leopard was planned to be a multi-year phased program. The NATO Snow Leopard NATO Training Federation (NTF) met Initial Operational Capability (IOC) in 2008 by supporting Steadfast Joiner 08. In this exercise, JWC hosted a distributed, multi-level NATO Response Force (NRF) Computer-Assisted Exercise (CAX). The NATO Live, Virtual and Constructive (NLVC) federation infrastructure met IOC in 2010 during the MSG-068 Stand Alone Experiment (SAE). NATO Snow Leopard Full Operational Capability (FOC) was expected in 2011 – 2012 timeframe. It was also expected that NATO Snow Leopard would demonstrate FOC by supporting a NATO event, meanwhile NETN development will continue to support operational requirements through a dynamic, evolving environment to provide flexibility and promote reusability.

## NATO EDUCATION AND TRAINING NETWORK

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In 2010, ACT changed the Snow Leopard Program name to Distributed Training and Exercises (DTE) to more clearly identify the program's purpose. DTE will progressively expand to capitalize on emerging technologies and include other NATO and Partner Nations as they acquire new capabilities. A fully operational, networked education and training capability led by Headquarters, Allied Command Transformation (HQ ACT) and centered at the Joint Warfare Centre (JWC), Joint Forces Training Centre (JFTC) and NATO School will allow NATO to distribute training and exercises across Alliance education and training centres, while at the same time enabling those forces to train together using the same key decision points and objectives necessary to make the NRF, CJTF, ISAF staffs and assigned forces ready to deploy.

NATO's transformation process builds on education and training by developing and inoculating interoperability, especially through linking NATO and national systems, forces and headquarters – and routinely practicing and refining tactics, techniques, and procedures to meet the evolving operational requirements. NATO DTE is a critical element of that solution set and will bring education and training to those who need it anywhere at anytime and will transform NATO intellectually, culturally and militarily.

Upon request by HQ-SACT, NMSG formed MSG-068 NETN to support NATO's DTE vision. Many of the previous experiences and products from NMSG activities, such as, MSG-027 (Pathfinder Integration Environment), MSG-001 (Exercise First WAVE), MSG-052 (Knowledge Network for Federation Architecture and Design), as well as from national and NATO distributed simulation events, established the starting conditions for MSG-068. In particular, MSG-001 (Exercise First WAVE), set the standard for MSG-068. MSG-001 and the NATO SAS-034 Task Group collaborated in a joint project executed between 2000 – 2004 to develop a prototype NATO synthetic Mission Training through Distributed Simulation (MTDS) environment to support a multi-national exercise and assess its potential to support training to enhance NATO's operational effectiveness in multi-national air operations. This 7-nation activity (CAN, DEU, FRA, GBR, ITA, NLD, USA) was known as "Exercise First WAVE" (Warfighter Alliance in a Virtual Environment), the first large simulation-based aircrew training exercise organised in NATO. The exercise explored issues of matching training requirements and technical capability and exposed the need for a multi-national exercise development team to address both these aspects. This experiment used DIS as its interoperability protocol and was run as unclassified event. The network infrastructure was based on commercial leased lines and was dismantled the day after the exercise finished.

In compliance with STANAG 4603, MSG-068 selected the High-Level Architecture (HLA) as the technology for integration and interoperability between simulation assets. Specifically, MSG-068 focused on HLA-evolved, which became IEEE standard 1516-2010 during the MSG-068 tenure, and one feature of IEEE 1516-2010, FOM modularity, was a key element in achieving the desired flexibility and maintainability level.

## 2.0 OBJECTIVES

The **objective of the MSG-068 NETN Task Group** is to assess the distributed simulation and learning capabilities that NATO, Partner and Contact Nations, Schools, and Agencies have that could contribute to the development of a NETN capability. The Task Group (TG) also recommends and demonstrates a way forward for interoperability, technical standards and architectures to link these training and education centres to provide a shared persistent capability. Finally, the TG identifies and recommends roles and responsibilities of the NATO, Partner and Contact Nation organizations responsible for distributing and maintaining M&S capabilities within the scope of NETN.

The following topics were covered under this TG to meet the objectives:

- Assessment of distributed simulation and learning capabilities with potential for inclusion in NETN.

- Recommendations for interoperability and technical standards.
- Recommendations for the development of NETN architectures.
- Recommendations for the assignment of roles and responsibilities for distributing, managing and maintaining NETN capabilities.
- Identify, develop and conduct experiments enabling NATO/PfP Nation's capabilities to participate in NETN.
- Roadmaps and technical reports in support of NETN.
- Demonstration of a limited NETN realization comprising JWC, JFTC and national simulation centres and systems.
- Run preparatory tests at ACT and national facilities and evaluate the results from these tests for risk reduction of the demonstration of the feasibility of the NETN-concept.
- Perform a demonstration of the feasibility of the NETN concept of a distributed networked training capability embracing JWC, JFTC and national simulation centre and the corresponding simulators, simulation systems and C2-systems.

### **3.0 THE REQUIREMENTS FOR NETN**

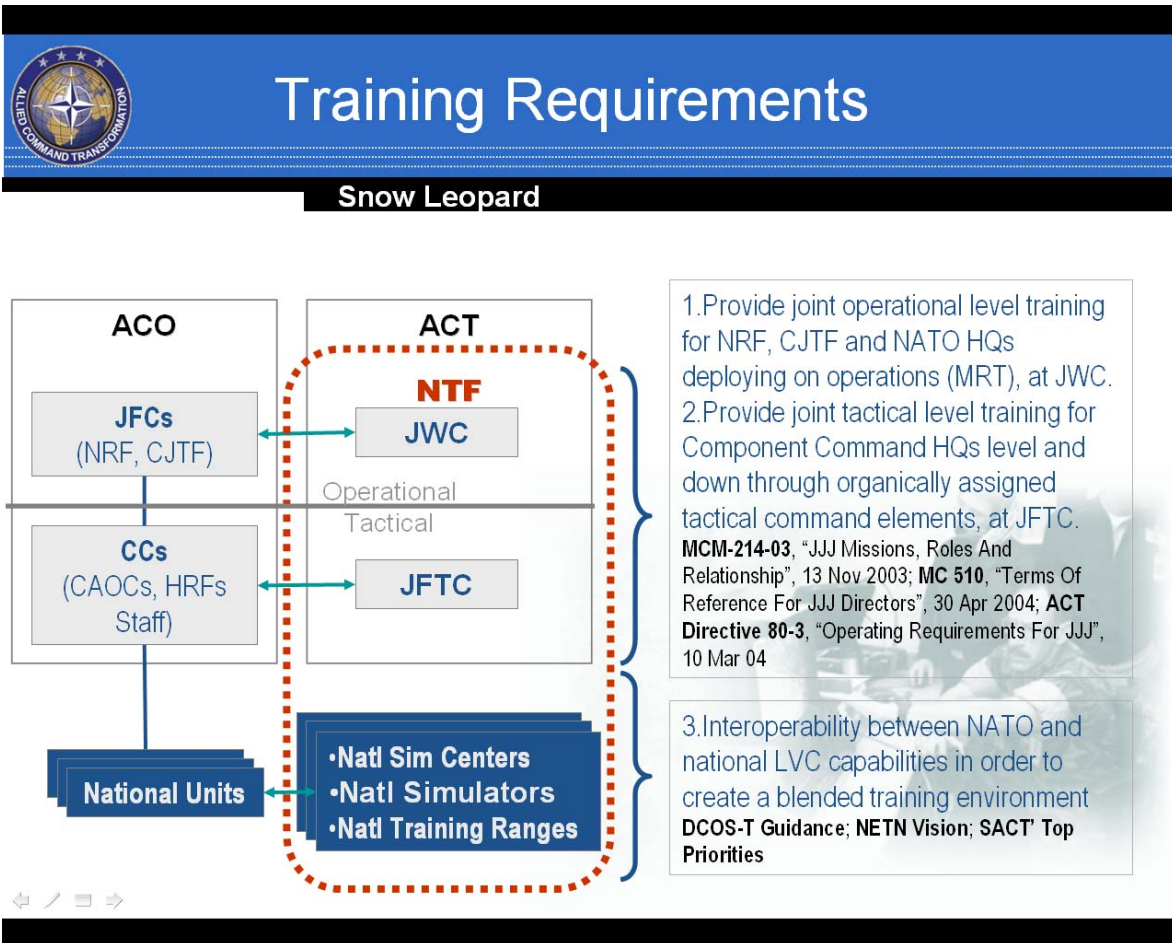
Over the last decade the world's strategic geopolitics have changed tremendously and NATO as a central key player has adapted itself to the new realities:

- NATO is fully committed in Afghanistan with some 30,000 troops conducting warfighting activities in certain areas.
- As part of the NRF concept, NATO might deploy a multi-national force out of Europe within a few weeks.

When NATO forces are deployed in theatre to conduct a joint operation, all forces from the Joint HQ down to the unit in the theatre of operation have to be trained on the specificities of the mission within a reduced time frame, typically less than 9 weeks. Depending on the command level of the force, the training is a NATO or a national responsibility and the most relevant vehicle of the training is different: aggregated constructive simulation, high resolution constructive simulation, virtual simulation and/or live simulation. Each type of simulation provides the details required to portray an operation at the appropriate resolution and to feed C2 information systems in a realistic manner.

In addition, the technology evolution over the last few years in the fields of communication systems, information sharing and multi-media means has impacted the way military forces are managing crises. New concepts such as Network Centric Warfare and Time Sensitive Targeting are using those technologies as a force multiplier by tying force components tightly together and reducing decision cycle processes. NETN should provide a solution at the NATO level to the challenging requirement of training a joint multi-national force in managing crises in this new era of warfare.

In this section we examine why NETN is needed and how it can serve this purpose. To do this we answer three questions, which appear as section headings of the section.



\* The term "Nations" refers both to NATO and Partner Nations.

Figure 1: Training Requirements.

### 3.1 Why Do NATO and Nations Need Multi-Level and Cross-Level Training?

NATO has a joint, multi-level command structure that needs to operate together. This necessitates multi-level and/or cross-level training. When multi- and/or cross-level training is conducted there may be parts of a Training Audience (TA) that have a set of training objectives different from the other parts of the TA. For example the training objectives of a maritime component command may be different from the ones for a JFC that joins the same exercise. If the training objectives are determined with a focus on a part of the TA, then the overall exercise is designed accordingly, which means the exercise may not fulfil the requirements of all of the TA. New multi-resolution exercise methodologies, constructs and technologies are needed to ensure all TA training objectives are met in the face of the following challenges:

- The training objectives of echelons differ from each other.
- There is a need to conduct an exercise in an overarching environment providing the possibility of high detailed realistic information.
- There is a need to practice information flow among the echelons.

- The decision cycles of forces deployed in theater are interdependent.
- The combined and joint nature of force structures has been increased.
- Most operations are conducted by diverse force elements that must work synergistically at all levels, from strategic down to tactical levels.

Despite those challenges, NATO anticipates the following benefits:

- Combining training events into a reduced number of multi/cross-levels training events yields efficiencies and reduces costs.
- Multi- and cross-level training can provide dynamic, capability based training across a full range of integrated operations between NATO forces, member forces, and partner forces.
- If the Nations train as they fight, both on the strategic and tactical level, then they will learn to operate as a cohesive force.

### **3.2 Why Do NATO and Nations Need LVC?**

Training audiences should be immersed in a realistic environment and situation that can be consistently maintained throughout the exercise. Constructive systems adequately simulate most theatre assets, but live and virtual systems are increasingly necessary to more accurately represent special assets present in current operational environments or to emulate C4ISR feeds available to Warfighters. For example, increasing use of UAVs in theatre has led to not only more detailed representation of UAV platforms in simulation environments, but the need to provide video feeds to training audiences expecting similar capabilities in theatre. All the components of this synthetic world must work together cohesively in order to achieve the training promises afforded by multi-resolution and LVC capabilities:

- True multi-level and cross-level training can only be achieved through LVC.
- LVC will support a broad spectrum of joint training requirements.
- LVC provides the capability to conduct coherent joint training across different levels of TA, and hence it will provide a seamless and more realistic training environment.
- NATO may need LVC to support exercises that include NATO-owned platforms, e.g., AWACS or specific nationally provided platforms that require specific interoperability measures.
- LVC training is required to achieve the necessary immersion of decision makers.
- LVC simulation systems are needed to standardize preparation for operations in an international environment; to reduce health and material risk; to make better use of resources (efficiency and effectiveness); to compensate for restrictions (e.g., environment protection, access to scarce resources by replacing them with simulated assets).
- The LVC will allow Nations to participate in a full spectrum training environment providing combined task force commanders and staffs a cost effective way to fully train disparate national forces into a cohesive fighting force.

### **3.3 What Are the Benefits of NETN for NATO and Nations?**

We can summarize the benefits of NETN for NATO and Nations as follows:

## **NATO EDUCATION AND TRAINING NETWORK**

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### For NATO:

- NETN will reduce the educational and training costs for all participants.
- NETN will improve the interoperability among all participants (NATO, Members and Partners).
- The NETN will be a persistent global network of live, virtual and constructive components, to include collaborative tools and services that provide a seamless training environment that supports a broad spectrum of NATO and Nations training requirements.
- It will support coherent training across different levels of TA, and it will provide a seamless and more realistic training environment. Moreover, it will deliver to the Alliance and Partners a distributed Education and Training Capability that will comprise distance learning and shared scenarios database capability.
- NETN will provide NATO and the Nations with the means to plan, conduct and control a comprehensive building block approach to the training of a multi-national force in the context of a common scenario and with a coordinated approach to training design and observation.
- NETN will improve the exercise quality and efficiency.
- Nations will have a better understanding of NATO's role and how to interact with NATO as well as ensure national forces are ready to conduct NATO operations in a coalition force structure.
- NETN will help to achieve better effects through standardization, reduced cost, resource savings, and certified units.
- Better and less expensive possibilities to do mission rehearsal.

### For Nations:

- Nations can conduct mission rehearsal with others (NATO/Nations) before going to mission (Train as you fight).
- NETN will reduce the cost for establishing training and experimentation networks.
- NETN will help to improve communications and exchange of experience among NATO Members. This is an excellent opportunity for education and training.
- NETN will provide means for cooperation between NATO HQ's, national HQ's and other members forces HQ's and units in collectively distributed LVC environments.
- NETN will improve interoperability between simulated or emulated national C2 systems in the NATO simulation environment.
- NETN will improve interoperability between NATO and national LVC.
- Nations will be able to access to standardized scenarios and geo-databases.
- Nations will be able to access to unified ADL content.
- Nations will be able to access to key technologies, technical standards and advance architectures for distributed LVC environments.
- Nations will be able to develop interfaces between national LVC systems and NTF.
- Nations will learn from experiments enabling new services for NETN.



- Nations will benefit from the improved environment NETN offers for crisis management training and education for civilian responding entities.
- Nations will benefit from the opportunities NETN provides for technology research, learning, innovation and business opportunities for SMEs and research organizations.

#### **4.0 ASSESSMENT OF DISTRIBUTED SIMULATION AND LEARNING CAPABILITIES**

MSG-068 conducted a survey to assess interest in NETN capabilities. The following questions were answered by Nations and organizations:

- Which Nations would like to join NETN?
- Which simulation centres would the Nations like to utilize for NETN?
- Which simulation systems, C2 systems, CIS systems, architectures, environments and tools are in use and will be in use in these simulation centres?
- What are the future developments that will impact NETN and Nations capabilities?
- What is the Nation's level of commitment to adopt NETN?

The following Nations are interested in NETN and have simulation centres that can participate in NETN: Australia, Belgium, Bulgaria, France, Germany, Italy, Netherlands, Norway, Romania, Slovenia, Spain, Sweden, Turkey, UK, USA.

There are many varied and numerous simulation and C2 systems that Nations use and which any NETN architecture would need to accommodate. Nations and organizations use different architectures and standards for constructing training and learning environments. Our findings in the survey can be summarized as follows:

- More joint and system-of-systems environments are required.
- National training networks should be integrated in NETN.
- Different architectures (mixed architectures, e.g., DIS and HLA), RTIs and federation agreements need to be integrated.
- Integration of COTS and live assets is also needed.

In general, the Nations which responded are committed to the NETN approach. This is corroborated by the following Nations which participated in MSG-068 and contributed in order to develop and demonstrate the feasibility of the NETN approach: Australia, Bulgaria, France, Germany, Hungary, Netherlands, Romania, Spain, Turkey, UK, USA.

#### **5.0 RECOMMENDATIONS FOR INTEROPERABILITY AND TECHNICAL STANDARD**

In order to achieve interoperability and rapid integration of simulation systems, MSG-068 developed a baseline NETN Reference Architecture. This architecture is defined in terms of a persistent infrastructure, federation agreements, shared resources, and common tool sets.

## **5.1 Persistent Infrastructure**

Although NATO and Nations conducted geographically distributed CAXs in the past, these used infrastructure that had to be re-established for every exercise. That proved costly and unresponsive. Technological advances suggest more cost effective, responsive, and efficient means to support current and future training requirements. MSG-068 established an infrastructure sub-group to investigate a number of options for a more persistent and cost effective infrastructure approach. This MSG-068 sub-group consisted of 15+ experts that worked collaboratively to develop the recommendations summarized below. The research results and recommendations with respect to the NETN persistent infrastructure are detailed in Annex C and E.

### **5.1.1 Exercises Requiring a Secure Infrastructure**

MSG-068 recommends the Combined Federated Battle Laboratories Network (CFBLNet) as the persistent backbone for NETN up to NATO SECRET. CFBLNet provides secure and managed services over a bearer network. Persistent in this context means services are provided with a guaranteed network availability and quality of service. The CFBLNet architecture allows users to create enclaves with various classification levels up to NATO Secret. An enclave can only have a single level of security classification at a time. However, the security classification of an enclave can be changed from one event to the other. A CFBLNet enclave may also be accessible by Partnership for Peace (PfP), Mediterranean Dialog (MedDialog), Istanbul Cooperation Initiative (ICI), Contact Nations, and the other Nations when the security classification of the enclave is established to allow these participants. The Nations may extend the CFBLNet to include their own training sites or, alternatively, connect the national CFBLNet Point-of-Presence (PoP) to a national secure network infrastructure. Notwithstanding the recommendation to use CFBLNet, MSG-068 found several issues which require improvement:

- The procedures for joining CFBLNet or extending an existing PoP should be simplified and clarified.
- When CFBLNet is used, it introduces another technical management level on top of the technical administration of the bearer networks. The user needs to manage these two layers separately for multiple sites, which is not always practical. A scheme to unify the management of infrastructure (i.e., to provide single point of contact for the infrastructure) needs to be developed.

### **5.1.2 Unclassified Exercises**

Not all exercises require the services for security and management provided by CFBLNet together with its attendant overhead and cost. It is possible to operate NETN federations over the Internet when the services provided by CFBLNet are not required. VPN over the internet may provide sufficient security or information protection for many events. The selection between the persistent CFBLNet solution and semi-persistent solutions like the Internet depends on the frequency of need for a classified (CFBLNet) capability. However, even Nations or organizations with infrequent classified event requirements may find that CFBLNet has a cost-benefit advantage in avoiding the engineering time in installing and closing networks and in the higher user fees paid for temporary installation.

### **5.1.3 Multi-Level Security Domains**

MSG-068 did not have time or resources to investigate multi-level security or cross-domain information exchange. Clearly this field is of interest and importance due to the mix of organizations, NATO, PfP, NGO, etc., and consequent need for improved policies and tools for information exchange. MSG-068 recommends better, more reliable, robust and practical multi-level security protocols and procedures. This topic is currently addressed by on-going NMSG studies, notably MSG-080, Security in Collective Mission Simulation.

## 5.2 NETN Federation Architecture and FOM Agreement

A MSG-068 Federation Architecture and FOM Design (FAFD) technical sub-group was created with 70+ representatives from the participating NATO and Partner Nations and organizations.

The purpose of the group was to develop a Federation Agreements and FOM Design Reference Document that will support the initial NETN Reference Architecture for NATO and the Nations.

The document provides a common reference Federation Agreements Document (FAD) for all federations in the NATO Education and Training Network (NETN) including a modular FOM with detailed information on data and information exchange between simulation systems in an NETN federation. The FAD and FOM are designed to be generic and can be used for live, virtual, constructive and multi-resolution federations at any level.

The FAFD group represents a broad community of practice with respect to federation architecture and design. Major systems, federations and training networks were represented in the FAFD group. The input provided and the harmonization of federation architecture and design agreements forms the basis of the NETN Federation Agreements and FOM Design Reference Document.

Key input to the development of the federation agreements includes:

- ALLIANCE (France);
- CASIOPEA (Spain);
- JLVC (USA);
- JMIRM (US and JWC);
- KOSI (Germany);
- NLVC (NC3A, Netherlands);
- P2SN (Sweden); and
- RPR-FOM v2.0 (SISO).

The recommendations from the MSG-068 FAFD sub-group are summarized below:

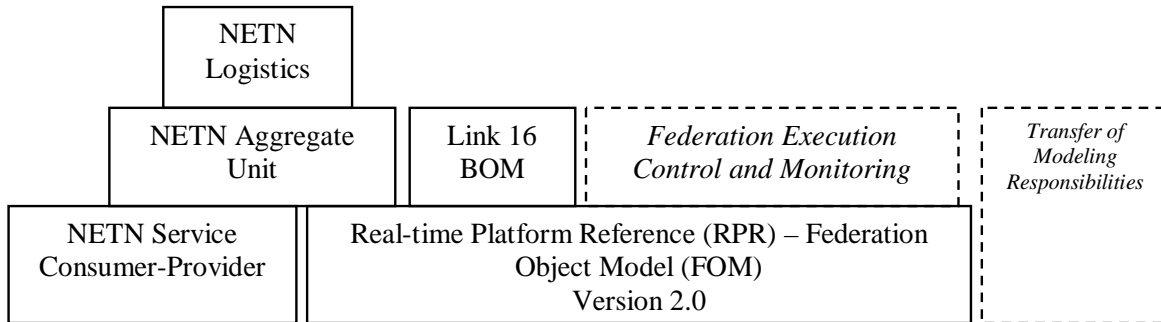
- In compliance with STANAG 4603 [9], MSG-068 recommends that the backbone of any NATO simulation federation is the latest version of the High-Level Architecture (HLA). IEEE 1516-2010 is the current HLA version and provides services and concepts that enable flexible and modular FOM development (see Figure 2).
- The Simulation Interoperability Standards Organization (SISO) has defined the Real-time Platform Reference FOM (RPR-FOM). MSG-068 recommends the SISO standard RPR-FOM v2.0 to represent ground-truth of platform and aggregate level simulated entities. The RPR-FOM object classes are extended with more detail in the NETN Aggregate Unit FOM Module.
- MSG-068 recommends the SISO standard Link 16 BOM for simulation of Link16 messages. This module also extends the RPR-FOM.
- MSG-068 recommends a new NETN Service Consumer-Provider FOM Module for modeling request, negotiation and delivery of services (see Annex C). This FOM module does not extend any other FOM module. The Service Consumer-Provider Pattern defines two types of entities:

- Service Consumer Entities; and
- Service Provider Entities.

Similarly federates that model these entities are called Service Consumer Federates and Service Provider Federates, respectively. If service entities are modeled in different federates the interactions will be published and subscribed using HLA services.

- MSG-068 recommends a new NETN Aggregate Unit FOM Module. This module is based on the Service Consumer-Provider Pattern with extensions to support aggregate and entity object attributes not contained in the RPR FOM. The NETN Aggregate Unit FOM Module also includes provisions for a combat adjudication service; this service will be addressed in further detail below.
- MSG-068 recommends a new NETN Logistics FOM Module. This module is based on the Service Consumer-Provider Pattern with extensions to support the following specific logistics services:
  - Supply;
  - Storage;
  - Repair;
  - Transport;
  - Embarkment; and
  - Disembarkment.
- The FAFD sub-group identified additional FOM Modules and also conducted some preliminary work on these. Due to time constraints and priorities these modules have not be finalized and verified in experimentation. The FAFD sub-group recommends that future work will continue to investigate and experiment with these modules in order to have them included in future versions of the FAD and FOM. These modules are: Federation Execution Control and Monitoring and Transfer of Modeling Responsibility.
- The FAFD sub-group identified additional IEEE 1516-2010 features that the team was unable to implement and test due to time constraints. The FAFD sub-group recommends future development and testing of smart update rate reduction, fault tolerance, Data Distribution Services as an enabler of scalability, web services, etc.
- The FAFD sub-group caveats the above recommendations by acknowledging that:
  - FAFD did not implement or test the combat adjudication service or Combat Adjudication Service Federate (CASF) described in the NETN Aggregate Unit FAD. The FAFD sub-group recommends future development of a CASF to evaluate the CASF FAD and FOM constructs. FAFD anticipates iterative development and testing of the CASF and FAD and FOM constructs will be required before the combat adjudication service can be recommended for inclusion in the MSG-068 Reference Federation Architecture.
  - FAFD did not test the SISO standard Link 16 BOM. The FAFD sub-group recommends future testing of the Link 16 BOM to evaluate its sufficiency for DTE use.
  - FAFD used only a sub-set of the object classes and interactions comprising the RPR FOM. The FAFD sub-group therefore recommends modularizing the RPR FOM in accordance with IEEE 1516-2010 FOM modularity principles.

- FAFD used and tested only a sub-set of the NETN Logistics FOM Module services. In the process of developing, testing, and assessing the NETN Logistics FOM Module, the FAFD sub-group concluded that it is unnecessarily monolithic and therefore recommends modularizing it in accordance with IEEE 1516-2010 FOM modularity principles.



**Figure 2: Modular FOMs Recommended for MSG-068 Reference Federation Architecture (Modules with dashed frame require additional work before inclusion in the FAFD).**

The complete NETN Federation Architecture and FOM Reference Document can be found in Annex C.

### 5.3 Shared Resources

MSG-068 did not directly address shared resources. However, a separate study by HQ-SACT [11] has addressed shared scenarios. The most important findings of the shared scenarios study are summarized below:

- The primary existing capability to share NATO produced operational level Scenarios and Settings (S&S) is provided by the Joint Warfare Center. This capability includes geo databases, the geo-strategic narrative situation, theatre of operations information, strategic initiation documents, crises response planning information, force activations and deployment information, main event and master incident lists (i.e., Joint Exercise Management Module databases) and simulation databases (i.e., Joint Theater Level Simulation and Virtual Battle Space databases). However, this capability is based on a manual process, limited to NATO headquarters and Nations, and has issues related to IT infrastructure.
- The premise that NATO HQs, Nations and non-NATO users would wish to re-use JWC S&S material remains to be proven. However, many organizations that use JWC-produced S&S for their internal exercises do not understand how to adapt material to suit their own training objectives and spend considerable effort trying to achieve this.
- There exists a NATO Simulation Resource Library (NSRL) [20]). This existing capability needs to be further improved such that it can allow the submission of new S&S meta data (i.e., information about the scenarios and scenario modules) and the access by a wider community. A prototype has been prepared for this purpose and tested during MSG-068 NETN Standalone Experiment.
- Collaborative ways of working based on Web 2.0 technologies should be considered.

In addition to the study, MSG-068 identifies the need for standard taxonomy, terminology and data formats for the reusability of settings, scenarios and scenario modules. There are already standards and directives for this purpose, such as, Military Scenario Definition Language (MSDL), Bi-SC Collective Training and Exercise Directive 75-3, C2 Information Exchange Data Model (C2IEDM), etc. The use of the above mentioned

standards is recommended in the NATO Allied M&S Standards Profile AMSP-01 [19]. However, all these can support only a sub-set of the shared scenario requirements.

In mid-tenure, MSG-068 evaluated using unique identifiers and the Joint Training Data Services (JTDS) Order of Battle Service (OBS) to provide scenario initialization information to all NETN federates. Providing common scenario initialization information to all federates enables data correlation among federates and reduces, if not precludes, instances of data mapping errors. While MSG-068 was, in the end, unable to make use of OBS, and consequently suffered numerous data mapping errors during the experiment, the NETN FOM does include provision for use of a unique identifier for each object instance. Evaluating these identifiers and a scenario initialization service must necessarily devolve to another NMSG, but MSG-068's experimental results clearly indicate the criticality of a comprehensive data strategy, particularly given the diverse systems envisioned for use in NETN.

## 5.4 Common Tools

In order to enable interoperability and the use of the infrastructure for events, we recommend the following key common tools:

- **CIS:** Collaborative tools are essential to support the development of Federation Agreements and to support test and integration. MSG-068 used a Wiki-based Collaborative Work Environment (CWE) as recommended by MSG-052. Telephone and video conferences were conducted using regular phones and Skype. In order to have a common tool for visualization of the simulation data Google Earth together with the tool Pitch GE Adapter was used. The simulation voice communications application PLEXCOMM was provided to allow users to role play various actors in vignettes and coordinate technical control matters.
- **Mixed Architecture:** The backbone needs to be the latest version of HLA. However, to support legacy and COTS simulation systems we recommend that gateways between the different architectures should be allowed.
- **Test and Integration:** MSG-068 established an experimentation and demonstration sub-group to provide services related to test and integration. We recommend a network overlay tool to simplify the technical set up for test and integration. In MSG-068 we used the Pitch Booster for this purpose.
- **Exercise and Scenario Management Tools:** These tools can be used for the automation of processes, information management and information exchange throughout an exercise process. They can help the preparation and management of scenario as well as the Main Event and Master Incident Lists (MEL/MIL). A MEL/MIL tool can also be very useful in synchronizing and managing the flow of an exercise according to the exercise objectives, as well as, planning, collecting and analyzing the observations. In MSG-068 we used JEMM (Joint Exercise Management Module) for this purpose.
- **Patterns:** MSG-068 recommends use of design patterns in developing FOM modules and corresponding FADs. Design patterns promote reuse by abstracting purpose from implementation. MSG-068's development and use of the Consumer-Provider design pattern exemplifies this abstraction and resultant reuse. Defining and documenting the conceptual relationship between a consumer and provider distinct from the specific implementation of a tanker resupplying fuel or maintenance personnel repairing a truck, enabled specification of the higher level key actions and important entities. These were then reused in not only instances of resupply or repair, but other situations, e.g., the "service" provided by a Combat Adjudication Service Federate (CASF). Design patterns complement FOM modularity, for example, the Consumer-Provider FOM module is distinct from the FOM modules supporting resupply or combat adjudication.

- **FEDEP-DSEEP:** MSG-068 recommends following the FEDEP [10] and the DSEEP standards to develop the NETN simulation federations and to execute the training and exercise events. NMSG-068 used the principles of FEDEP, particularly in developing the federation agreements and design, and in executing the experimentation and demonstrations.

## **6.0 RECOMMENDATIONS FOR THE DEVELOPMENT OF NETN ARCHITECTURES**

MSG-068 recommendations are not complete to bridge the recommended reference architectures and operational processes and architectures. To fill this gap, we recommend a follow on technical activity, which focuses on the operational issues related to NETN.

### **6.1 Reference Architecture**

The NETN Reference Architecture comprises guidance for:

- Persistent Infrastructure;
- NETN Federation Architecture and FOM Agreement;
- Shared Resources; and
- Common Tools.

The NETN Reference Architecture provides the foundation for developing national and NATO training networks (NETN Target Architecture). An NETN Target Architecture is a tailored instantiation of the NETN Reference Architecture for a (Target) Exercise Architecture.

MSG-068 recommends that the core documents in the NETN reference architecture are managed by NMSG. Nations and organizations implementing NETN target architectures should use the recommendations provided by this group and provide feedback regarding improvements or extensions that should be integrated in the reference architecture (e.g., new FOM modules). Further research with respect to extending the reference architecture should be coordinated by a persistent NMSG sub-group in charge of technical guidance, i.e., the M&S Standards Sub-group (MS3).

### **6.2 Exercise Architecture**

Exercise architecture has two main components: Training Audience (TA) and Exercise Control staff (EXCON). TA is the focal point in an exercise structure. TA can be single level, multi-level, cross-level and both cross- and multi-level as shown in Figure 3:

- Single level training audience represents a single level of command trained at the same time in the context of a single scenario.
- Multi-level training audience represents multiple levels of command trained at the same time in the context of a single scenario.
- Cross-level TA includes units or headquarters at the same level of command. When the units in a cross-level TA are from different services, the exercise becomes joint.
- Multi- and cross-level is a mix between multi-level and cross-level.

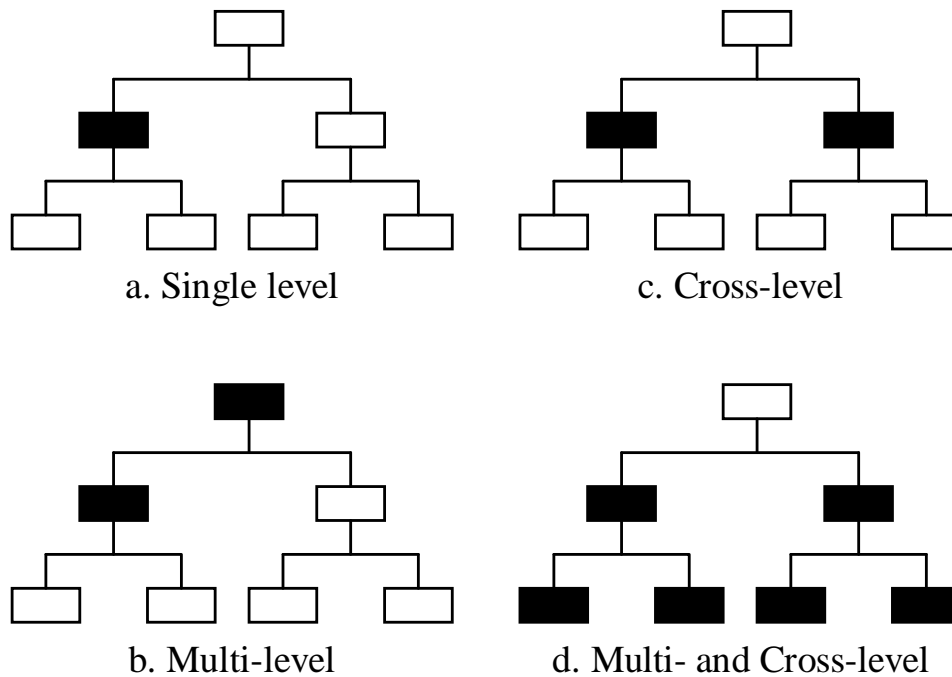


Figure 3: Training Audience.

A TA can have Headquarters (HQ) and/or forces from different Nations, which makes the exercise combined. In more and more exercises civilian national/international agencies and organizations like police, fire department, health agencies and UN are involved in. These civilian organizations usually become a part of EXCON and constitute white or grey cell. They may also be a part of TA. EXCON structure and white/grey cell concept is explained later in this section.

TA can be co-located or various parts of TA can be located in geographically remote sites (i.e., different cities, countries or continents). The exercises that have TA components located remote sites are called distributed exercises. Please note that distributed simulation means different from distributed exercise. A distributed exercise can be supported by a centralized simulation system or a centralized exercise can be supported by a distributed simulation.

In NETN, TA can be more complex than a typical NATO or national exercise, such as the following:

- TA composed of HQs or forces from several Nations (any composition of NATO, PfP, MedDialog, ICI, contact or coalition) without a NATO HQ; and
- TA composed of HQs or forces from several Nations (any composition of NATO, PfP, MedDialog, ICI, contact or coalition) with a NATO HQ.

The other component in an NETN exercise structure is the Exercise Control staff (EXCON). A typical EXCON structure is shown in Figure 4. Training Team (TT) consists of mentors, Observer/Trainers (O/T), Subject-Matter Experts (SME) and analysts. TT is deployed with TA, observe TA, provide onsite instructions and training, and collects inputs for AAR and the evaluation of TA. The Exercise Center (EXCEN) is the organization responsible for the consistent and coherent flow of the exercise according to the Exercise and Training Objectives (ETO). EXCEN is explained in detail below. Experimentation team runs the experiments planned in conjunction with



the exercise. Finally support team has the elements like Real-Life Support (RLS), Visitor Officer Bureau (VOB), Public Information Centre (PIC), security office and computers/communications support team.

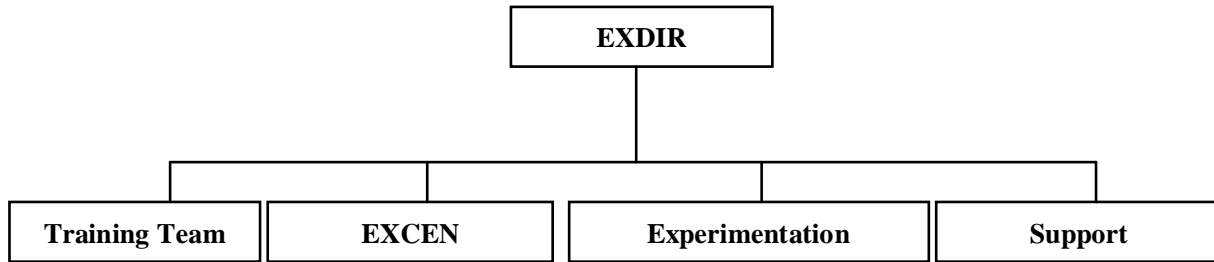


Figure 4: EXCON Structure.

EXCEN functions (see Figure 5) can be categorized into five broad classes as Control Centre (CONCEN), Higher Control (HICON), Lower Control (LOCON), white/grey cell and Situation Forces (SITFOR). CONCEN monitors the current status of the exercise closely and steers it according to the ETO. HICON and LOCON represent the command levels/echelons that would normally be at the level above and below the TA respectively. LOCON and HICON consist of Response Cells (RC). The number of RC is dependent on the scenario and the TA. Each RC is made up of a number of planners, a number of simulation operators and coordination staff. RC are the main interface between simulation and exercise as explained later in this section. White/grey cell is a response cell that is composed of Subject-Matter Experts (SME) or role players representing agencies, organizations, institutions and individuals outside of the own or opposing force structure. SITFOR is the cell that manages the status of all the own and opposing forces in the scenario except for the ones represented by HICON and LOCON. When opposing side is also played by a part of the TA, only the parts of forces not controlled by the TA is managed by SITFOR.

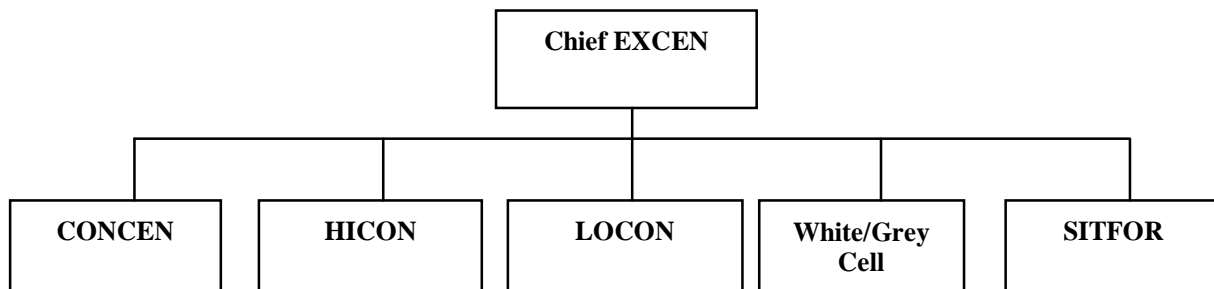


Figure 5: EXCEN Structure.

In NETN, there can be multiple EXCON (see example Figure 6a) or split EXCON (see example Figure 6b) that work collaboratively or in coordination. In the Figure 6b, the HICON is a part of EXCON NATO. For the other TA, the higher level command is the TA NATO.

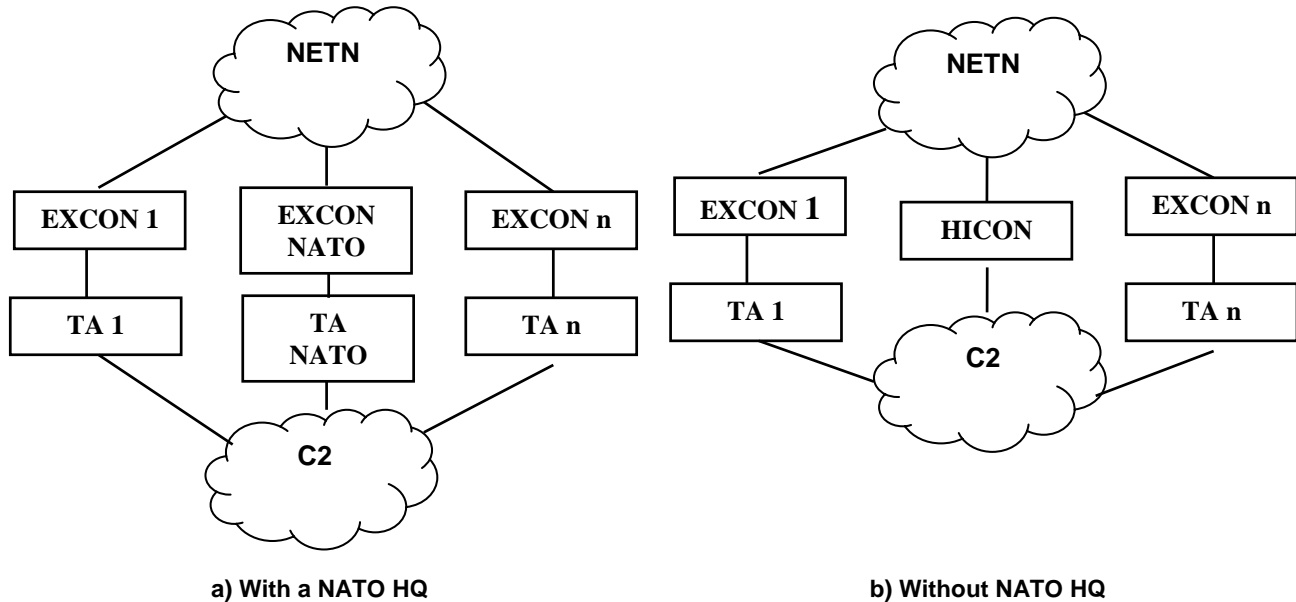


Figure 6: Examples for NETN Target Architectures.

### 6.3 Using NETN

In order to support training, an exercise architecture that meets the requirements of the specific exercise is required. To develop this exercise architecture, the NETN reference documents provide some support. However, to meet the objectives of an exercise, operational objectives need to be transformed into technical federation requirements.

Processes such as FEDEP/DSEEP can be used to support the development of NETN exercise architecture to fit operational requirements. The current NETN Reference Architecture does not include specific recommendations to support the development of NETN exercise architecture. Experimentation within MSG-068 had technical objectives only. No experiment related to the process transforming operational objectives to technical federation requirements was conducted. Therefore MSG-068 recommends tailoring DSEEP to support this transformation to technical requirements.

## 7.0 RECOMMENDATIONS FOR THE ROLES AND RESPONSIBILITIES

MSG-068 NETN TA recommendations for the roles and responsibilities are as follows:

- Maintenance of the NETN Federation Architecture and FOM Design (FAFD) Reference Document: MSG-068 recommends that a focus group working under the NMSG M&S Standards Sub-group (MS3) is given the task to maintain the core NETN Reference Architecture documents including federation agreements and the NETN FOM modules. Configuration management related to the individual FOM Modules and the entire reference agreements are to be handled by this group. The group should report to MS3 and NMSG on the current state of the documents and make recommendations to task groups concerning its use. The group should also receive input and feedback from users (including NMSG Task Groups) on their requirements, proposed updates or new additions related to federation agreements and FOM modules.

- Operations and maintenance of an NETN persistent infrastructure and services: MSG-068 recommends that NATO establish and maintain a persistent infrastructure and provide common services as described in Annex D. The establishment of this persistent infrastructure should be based on a capability package. The maintenance team should report to NMSG on the current state of the infrastructure and make recommendations regarding updates, proposed research work, etc., based on input and feedback from users.
- Verification, Validation and Accreditation (VV&A): MSG-068 recommends that NATO and Nations should perform VV&A on simulation assets according to the Generic Method for Verification and Validation (GM-VV) procedures that are currently being developed by a joint team of MSG-073 and SISO. Depending on future developments, a NATO body may become available to provide this service for NATO assets as well as for Nations if desired.
- Configuration management of the components (simulations and tools) within NETN: MSG-068 recommends that all assets belonging to NETN are configuration managed and maintained by an appropriate body to ensure continued FAFD compliancy. That role may be a NATO body or a Nation depending on the asset that acts as the custodian of the asset.
- Configuration management of NETN Federations (NATO and Nations): Specific Federations may have extended Federation Agreements and FOMs that are not likely to become part of the Reference NETN. MSG-068 recommends that all Federations based on NETN are configuration managed and maintained by an appropriate body to ensure continued FAFD compliancy. That role may be a NATO body or a Nation depending on the asset that acts as the custodian of the Federation.
- Settings and Scenarios (NATO and Nations): MSG-068 recommends that all Settings and Scenarios that are used in (one or more) Federations based on NETN are configuration managed and maintained by an appropriate body to ensure continued FAFD compliancy. That role may be a NATO body or a Nation that acts as the custodian of the target Federation.
- Development and continuous improvement in NETN (NMSG): Further research with respect to addressing some of the gaps identified in the reference architecture should be coordinated by the NMSG through the establishment of technical Task Groups (TG). These TGs could for example investigate issues like C2-Simulation interoperability, which is a special case of interoperability with live systems, or topics like multi-level security.
- Procedures for certification of federates and federations: MSG-068 recommends that NATO and Nations should perform HLA certification on simulation assets that are intended for NETN according to the procedures defined by the NMSG Certification Advisory Group (CeAG). Note that CeAG reports to NMSG MS3. Several commercial organisations and some government offices provide Certification services according to the CeAG procedures. MSG-068 also recommends that CeAG should further develop its procedures and tool support to provide a deeper, more comprehensive and thus more valuable certification that extends beyond basic HLA compliancy.
- Integration and testing of federations: Certification of individual assets is a first step towards improved integration and testing of federations. MSG-068 recommends that NATO and Nations should follow current best-practices according to FEDEP/DSEEP. There is however certainly work to be done by NMSG to develop more guidance in this area.

## **8.0 EXPERIMENTATION AND DEMONSTRATION**

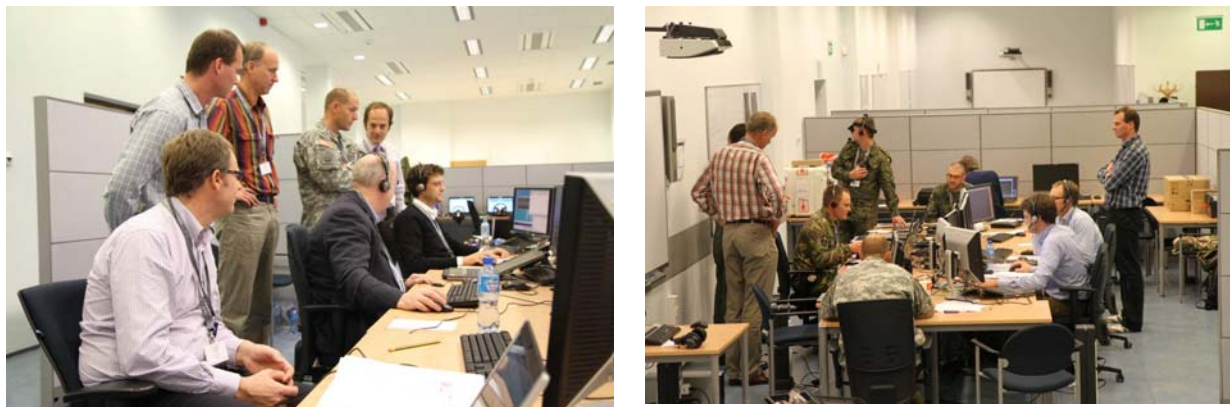
MSG-068 recommendations were tested in a standalone distributed experimentation event between October 25 and November 5, 2010. Ten Nations (Bulgaria, France, Germany, Hungary, Netherlands, Spain, Sweden,

## NATO EDUCATION AND TRAINING NETWORK

Turkey, UK, US) and 5 NATO HQs/organizations (HQ-SACT, JWC, JFTC, NC3A, M&S CoE) joined the experiment from one of 5 different locations (Bydgoszcz, Paris, Ottobrunn, Porton Down, The Hague). JTLS, JCATS and PLEXCOMM from the U.S., TYR from Sweden, VBS2 from Australia (three separate copies of VBS2), MARCUS from Hungary, ORQUE and WAGRAM from France, VR-Forces from Spain, FACSIM from the Netherlands, KORA from Germany and ITC/FLAMES from NC3A were federated by using MSG-068 Reference Federation Architecture during the experiment.

The experiments are grouped into three categories as technical experiments for the infrastructure, technical experiments for the reference federation architecture and operational use case experiments for the NETN federations. The following two incidents were designed for the technical experiments for the reference federation architecture:

- Incident 1 (Campaign 1) consists of a sea lift, a UAV recce, a cruise missile strike, a ground strike with close air support and indirect fires, a blocking by marines and a MEDEVAC.
- Incident 2 (Campaign 2) consists of a UAV recce, an air strike, two ground strikes, a blocking by marines, a hostage situation, repair of equipments and ammunition resupply.



**Figure 7: Experiment Cells.**

In every part of these incidents multiple federates (i.e., simulation systems) were involved in and interacted with each other through a federation built on NETN Reference Federation Architecture. Both Campaign 1 and 2 were run first in the Internet. Then Campaign 1 was run in the CFBLNet when the bearer was NGCS. Finally Campaign 2 was run in the CFBLNet when the bearer was the Internet.



**Figure 8: Experimentation Center.**

Also the following four incidents were executed to test the operational use cases: a MEDEVAC incident, a VBS2-NATO demonstration for advanced distributed C-IED training, a Forward Air Controller (FAC) training by using NLVC and a shared scenarios demonstration. FAC training by NLVC consisted of a Forward Air Controller in Bydgoszcz, an F-16 pilot in The Hague, a UAV in Porton Down and a second UAV in Bydgoszcz. The vignette was repeated three times for a different FAC each time. The FACs were operational people from Poland (2x) and Germany, the FAC instructor came from the Dutch Air Ground Operations School.

First impression report of MSG-068 Final Experiment is at Ref. [12]. NC3A also conducted a survey during the experiment. The results of this survey are at Ref. [13]. Based on the analysis of comments provided by respondents of the NETN Survey, the following additional recommendations can be made:

- Enhance the technical standards to include areas such as:
  - Distributed exercise preparation and management;
  - Integration of NATO and national C2 systems with the training environment;
  - Allocation of the execution of tasks within the federation;
  - Management of perception;
  - Management of multi-granularity (multi-resolution);
  - Shared scenarios; and
  - Federation management.

*Benefit: Wider application potential of the recommendations to the exercise domain.*

- Expand procedures and tools to ensure compliance of federates and processes with the complete set of technical standards. The responsibility and roles in compliance testing should be assigned explicitly.

*Benefit: If compliance is ensured, composing and configuring a federation for a distributed exercise will require less time and the risk during execution will be reduced significantly.*

- Sustain the use of CFBLNet, but validate the assumption about CFBLNet's ability to provide secure services.

*Benefit: Efficient environment for federation composition and expansion.*

During the I/ITSEC 2010 conference MSG-068 provided also a live demonstration of the core NETN technologies. Systems from France, Germany, Spain, Sweden, UK, USA, NC3A, Joint Warfare Center (JWC) and Joint Force Training Center (JFTC) were connected in a distributed federated simulation running both locally in the booth and connected to remote sites in Europe. The following simulation systems participated in the demonstration:

- ORQUE, WAGRAM (France);
- JTLS (JWC);
- VBS2 (UK);
- KORA (Germany);
- ITC FLAMES/ICC (NC3A, JFTC);
- TYR, pRTI1516 Evolved (Sweden);
- PLEXComm (USA);
- JCATS (USA); and
- VR Forces (Spain).

### 9.0 CONCLUSION AND WAY AHEAD

NATO Modelling and Simulation Group of NATO Research and Technology Agency started MSG-068 NETN upon request by HQ-SACT in 2007. Thirteen Nations and five NATO organizations contributed to MSG-068 to develop and demonstrate standards and recommendations for a persistent education and training network that comprises of tools for advanced distributed learning, resource sharing and distributed simulations.

MSG-068 conducted a standalone experiment in order to validate the MSG-068 recommendations for:

- A secure, persistent, on-demand training capability that integrates national centres and NATO;
- Capability and readiness of NATO, Nations and national simulation centres to link into NETN;
- Distributed simulation integrating NATO and national M&S capabilities;
- Multi-granularity;
- Technical standards;
- Distributed training involving national and NATO C2 and simulation systems; and
- Shared scenarios.

The experiment achieved the objectives in validating the recommendations and clarifying the requirements for further improvements. The requirements for future work can be categorized into three classes:

- The requirements related to infrastructure can be listed as follows:
  - The procedures for joining CFBLNet or extending an existing PoP should be simplified and clarified.
  - When CFBLNet is used, it introduces another technical management level on top of the technical administration of the bearer networks. The user needs to manage these two layers separately for

multiple sites, which is not always practical. A scheme to unify the management of infrastructure (i.e., to provide single point of contact for the infrastructure) needs to be developed.

- Better, more reliable, robust and practical multi-level security protocols and procedures are yet to be investigated and developed for more flexible infrastructure.
- CFBLNet may be a semi persistent solution used for specific events when needed for some Nations. The selection between persistent and semi persistent solution depends on the frequency of CFBLNet usage. The implications of this approach needs to be further studied with more detailed technical and procedural perspective by a focus group.
- Further clarification and experimentation with respect to integration of other simulation architectures into NETN (e.g., gateways integrating live players) is required.
- The requirements related to FAFD can be further grouped as follows:
  - The FAFD issues identified but not addressed:
    - Transfer of Ownership (Modeling Responsibility);
    - Further modularization of FOM Modules, e.g., RPR-FOM;
    - Extension of NETN FOM modules to support the other data links; and
    - Agreements on scalability and performance.
  - The issues requiring additional development, test and experimentation:
    - Protocol for Aggregation/De-aggregation;
    - Transfer of Control in Aggregation/De-aggregation;
    - Combat Adjudication;
    - Federation Execution Control; and
    - Exceptions and Variations of Logistics Patterns.
  - The requirements related to shared scenarios has been grouped as follows:
    - HQ-SACT has completed a project on shared scenarios, and the results from this project are included as a reference [11] in this report. The project determined some shortcomings in shared scenarios concept in particular on how to apply the available material to user needs. MSG-068 recommends that ACT develops and organizes a training program for this purpose.
    - Providing common scenario initialization information to all federates enables data correlation among federates and reduces, if not precludes, instances of data mapping errors. MSG-068 recommends further study of common scenario initialization methodologies and tools.

Apart from the infrastructure, FAFD and shared scenarios, MSG-068 also developed recommendations with respect to roles and responsibilities, and additional work. This set of recommendations need to be implemented by NATO and the Nations to achieve the NETN vision. For NATO, MSG-068 recommends either a new capability package or an amendment to an existing capability package to act on the recommendations.

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## Annex A – TECHNICAL ACTIVITY PROGRAM

<b>Activity</b>	TG	<b>Activity Title</b>	<b>Approval</b> TBA
<b>Activity Ref. Number</b>	MSG-1xx	Distributed Training and Exercises (DTE)	<b>Start</b> 06/2011
<b>Location and Dates</b>		Multiple locations	<b>End</b> 06/2014
<b>Coordination with other bodies</b>	NMSG, ACT, NC3A, NATO M&S COE		
<b>NATO Classification of Activity</b>		UU	<b>Non NATO Invited</b> Yes
<b>Publication Data</b>		TR	UU
<b>Keywords</b>	Interoperability, Simulation, Planning, Analysis, Operational support, Combined Joint Operations		

### I. BACKGROUND AND JUSTIFICATION

In 2007, HQ-SACT initiated a NATO Education and Training Network (NETN) project, which later became Program Snow Leopard, to establish a persistent, joint NETN capability at the strategic, operational, and tactical levels by leveraging existing national capabilities. In 2010 Snow Leopard was renamed Distributed Training and Exercises (DTE) to more clearly identify the program's purpose.

The DTE vision provides dynamic, capability-based training for NRF, CJTF, and NATO and Partner Nation forces in support of NATO security objectives across a full range of integrated operations. DTE will comprise virtual and constructive (VC) environments, and leverage distributed training and shared resources to ensure that NATO and Partner forces receive state-of-the-art training relevant to current operational requirements.

NATO M&S Group 068 developed initial technical solutions to enable DTE. A final Stand Alone Experiment (SAE) showed the technical feasibility of a network of distributed simulations. A demonstration during I/ITSEC 2010 elicited strong interest from numerous nations for a reference architecture and community standards.

However, the initial technical capability is insufficient to support the full DTE vision. NMSG-068 recommended additional technical development. NMSG-068 noted the lack of an established long term process for the maintenance of the initial reference architecture and standards, nor provisions for improvement. Finally, NMSG-068 was unable to more closely link or assess its capabilities against the operational support requirements.

### II. OBJECTIVE(S)

The objective of the Task Group (TG) is to establish a long term process for the maintenance of the initial reference architecture and standards. The TG will also recommend a process consistent with the IEEE 1516.3 Federation Development and Execution Process (FEDEP) whereby Nations and Partners may

## **ANNEX A – TECHNICAL ACTIVITY PROGRAM**

---

recommend and realize improvement in the reference architecture and standards. Finally, the Task Group will act on NMSG-068 recommendations for technical development to evolve the initial reference architecture and standards to a degree sufficient to support NRF, CJTF, and NATO and Partner Nation exercises.

### **III. TOPICS TO BE COVERED**

- 1) Establish a long term maintenance process for DTE products (FOM, FAFD, certification, standardisation).
- 2) Establish a process for DTE product improvement consistent with the IEEE 1516.3 FEDEP.
- 3) Establish a process for scenario generation and data correlation sufficient to support NRF, CJTF, and NATO and Partner Nation exercises.
- 4) Enable transfer of modelling responsibility/ownership transfer in DTE federations to support NRF, CJTF, and NATO and Partner Nation exercises.
- 5) Recommend means to improve scalability in DTE federations sufficient to support NRF, CJTF, and NATO and Partner Nation exercises.
- 6) Provide guidance for the organization and management of distributed exercises.
- 7) Support distributed exercises proposed by the nations.

### **IV. DELIVERABLES AND/OR END PRODUCT**

- 1) Process for DTE maintenance and product improvement consistent with the IEEE 1516.3 FEDEP.
- 2) Improved DTE products (data mapping, transfer ownership, scalability, etc.).
- 3) Guidance for the organization and management of distributed exercises using DTE.
- 4) Recommendations for the DTE product updates.
- 5) Lessons learned in DTE product support of a NATO and/or Partner Nation exercise(s).
- 6) Testing Documentation, results, and recommendations.
- 7) Final technical report.

### **V. TECHNICAL TEAM LEADER AND LEAD NATION**

ACT

LTC Laurent Tard, France

Ms. Amy Grom, USA

Sweden (Ulf Jinestrand) will be contacted by France (TBC)

### **VI. NATIONS AND ORGANIZATIONS WILLING TO PARTICIPATE**

Canada (?), France, Germany (?), The Netherlands (?), Spain (?), Sweden (?), United Kingdom (?), United States of America, ACT, Joint Warfare Centre (JWC) (?), NC3A (?), NATO M&S COE (?), Others ???

## **VII. NATIONAL AND/OR NATO RESOURCES NEEDED**

- 1) National and NATO technical staff.
- 2) Travel costs for nations and NATO organizations.
- 3) Unclassified information about national training lessons learned.
- 4) Tools for distributed exercises.
- 5) Network assets.
- 6) Unclassified national and NATO ORBAT data.
- 7) HQ-SACT funding for the NC3A participation.
- 8) Support from national and NATO centres of simulation and training.
- 9) Invitations to support distributed exercises.

## **VIII. RTA RESOURCES NEEDED**

MSCO support.

Publication of reports.



## **Annex B – NETN SURVEY: BACKGROUND AND INTRODUCTION**

NC3A conducted an ACT-sponsored survey as part of the NETN Experiment in November 2010. The aim of the survey was to provide an assessment of the effort needed to establish and operate the NETN capability. Although the number of responses to the survey was limited, they were sufficient to develop initial recommendations. However, the number of responses was too limited to be able to present a full picture.

### **B.1 OBSERVATIONS**

- 1) Due to the limited number of valid responses, we couldn't establish a baseline on the overall effort needed to prepare and execute a distributed training event based on NETN. However it seems that the effort is moderate and comparable to other federations that are applied in most nations and NATO organizations.
- 2) Due to the limited extent of the vignettes and technical focus of the experiment, the teams at all sites were small. Therefore there was no need for a formalized approach to distributed coordination of the experiment preparation and execution. A simple combination of tools like VoIP and phone was used.
- 3) Although focused technical compliance testing was clearly defined and well supported by tools, it was not sufficient to prevent undesirable side effects during execution of the various vignettes.

### **B.2 CONCLUSIONS**

The table below summarizes the Analysis Objectives and the answers that were provided by Survey respondents.

<i>Analysis objectives</i>
<b>AO2.1: To which extent is it feasible to establish and operate a secure, permanently available (it is there and tested but not necessarily running) training infrastructure between NATO and national training centres that can be used on demand using CFBLNet?</b>
<b>Answer: It is feasible to establish and operate a permanently available training infrastructure between NATO and national training centres using CFBLNet. CFBLNet services are available on-demand, require low effort to establish and operate, and provide good quality of service. The security aspect has not been experimented with, but CFBLNet has a proven track record in providing secure services.</b>
<b>AO2.2: To which extent were alternatives to CFBLNet considered?</b>
<b>Answer: Internet was considered and used as an alternative to CFBLNet. However, making the Internet connection secure would be much more difficult than in case of CFBLNet.</b>
<b>AO2.3: To which extent could alternatives to CFBLNet be considered?</b>
<b>Answer: Not available.</b>

*Analysis objectives*

**AO3.1: To which extent is it feasible to establish and operate distributed simulation integrating NATO and national simulations and training management tools?**

**Answer:** An analysis of the answers to the various questions that were developed to assess the feasibility to establish distributed simulation shows that a concerted sizeable effort by specialised personnel is required for an extended period. Indeed the contribution to the FOM development required an average of 72-man-days by a team of 3 to 4 specialist personnel, a limited investment (avg 20 KEuro) in tools and travel. Compliance testing required an additional average effort of 60 man-days by a team of 2 to 3 specialist personnel and avg 25 KEuro investment. Answers pertaining to the actual operational usage and the associated data preparation and federation management effort were not received. Therefore we cannot make any conclusions about the operation of distributed simulation in an actual operational training context.

**AO3.2: To which extent were other options to achieve similar objectives considered?**

**Answer:** Seven responses were received that indicate that alternatives were studied. The assessment is that an average of 100 to 120 man-days would be required by a team of 2 to 4 specialist personnel to extend a single simulation to provide the functionality that was provided by the NETN federation. An average investment of 50 to 60 KEuro would be required to complement the development effort.

**AO4.1: To which extent are the technical standards that have been applied in the development of the NETN federation sufficient to support the establishment and operation of a flexible distributed simulation environment integrating NATO and national simulation and training management tools?**

**Answer:** The technical standards are sufficient to a limited extent. They are clear and they enable simulations to talk with each other, but do not cover other important areas like management of the network and of the federation, perception, and interface to C2 systems. Application of the currently recommended technical standards requires considerable effort, which is however not different from effort needed to apply previous technical standards.

**AO6.1: To which extent can the shared scenario library be filled and searched to enable exercise designers to share and retrieve useful scenario descriptions?**

**Answer:** Submission is not entirely clear and requires more explanation of the terms that are being used. The submission tool combines easy and more complicated parts. Its user friendliness can do to be improved. Searching the library is a simple mechanism. As above, conclusions need to be qualified due to the very limited response.

**AO6.2: With respect to the scenario that is being used in the NETN experiment, to which extent can an existing scenario be shared across a federation?**

**Answer:** Responders indicated that the average level of effort that was required consisted of approximately 25 man-days for each simulation to set-up data in accordance with the existing scenario by a specialist team of 1 to 2 persons and an investment averaging 25 KEuro for tools and travel. Data expansion was required in most cases to a limited extent. Limited effort was devoted for data and entity behaviour.

*Analysis objectives*

**AO7.1: To which extent can the NETN reference architecture support distributed simulation integrating NATO and national simulations and training management tools at multiple levels of granularity?**

**Answer: The selection of granularity is considered difficult when there are options. Indeed in an entity-level simulation the level of granularity is fixed. The experiment scenario did not provide sufficient opportunity to test this aspect.**

### **B.3 ADDITIONAL RECOMMENDATIONS**

Based on the analysis of comments provided by respondents of the NETN Survey, the following additional recommendations can be made:

- 1) Enhance the technical standards to include areas such as:
  - Distributed exercise preparation and management;
  - Integration of NATO and national C2 systems with the training environment;
  - Allocation of the execution of tasks within the federation;
  - Management of perception;
  - Management of multi-granularity (multi-resolution);
  - Shared scenarios; and
  - Federation management.

*Benefit: Wider application potential of the recommendations to the exercise domain.*

- 2) Expand procedures and tools to ensure compliance of federates and processes with the complete set of technical standards. The responsibility and roles in compliance testing should be assigned explicitly.

*Benefit: If compliance is ensured, composing and configuring a federation for a distributed exercise will require less time and the risk during execution will be reduced significantly.*

- 3) Sustain the use of CFBLNet, but validate the assumption about CFBLNet's ability to provide secure services.

*Benefit: Efficient environment for federation composition and expansion.*







**Annex C – NETN  
Federation Agreements and FOM  
Reference Document v1.0**

DRAFT 4

MSG-068 NATO Education and Training Network  
Federation Architecture and FOM Design Technical Subgroup

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# 1 Introduction

## 1.1 Purpose

The purpose of this document is to provide a common reference federation agreements document (FAD) for all federations in the NATO Education and Training Network (NETN). Agreements that are common to all NETN based federations are specified in this document. Templates for documenting required federation specific agreements are also provided. Principles and format for information exchange between federates in a NETN based federation is defined in the FAD. As part of the federation agreements a module based HLA reference Federation Object Model (FOM) is provided.

## 1.2 Use

This document is intended to be used as a template and/or reference when developing federation specific agreements. In any specific federation more detailed and other types of agreements are almost always required. This reference agreement document is not intended to replace the need for developing federation specific agreements.

## 1.3 Background

This version of the NETN Reference FAD was developed by NATO Modeling and Simulation Group (NMSG) Task Group MSG-068 NETN. This task group was initiated to support the ACT Snow Leopard Program with M&S recommendations for establishing a NATO wide network for education and training (NETN), a.k.a. Snow Leopard.

A technical subgroup of MSG-068, Federation Agreements and FOM Design (FAFD) subgroup was created with representatives from the participating NATO and partner nations. This group represented a broad community of practice with respect to federation architecture and design. Major systems, federations and training networks were represented in the FAFD group. The input provided and the harmonization of federation architecture and design agreements forms the basis of this document.

Key input to the development of this FAD includes:

- ALLIANCE FOM
- CASIOPEA FOM
- JLVC FOM
- JMRR FOM
- KOSI FOM
- P2SN FOM
- RPR-FOM v2.0

## 1.4 Acknowledgements

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## 1.5 References

While this document is intended to be sufficiently complete to be read stand alone, time does not allow for all concepts to be explained fully. Please refer to the documents referenced below for more details. This document borrows especially heavily from the RPR-FOM v2.0 D17 documentation. In the case of differences between this document and the references, this document is primary.

*The list of references indicates relevant standards that should be considered during the development of distributed simulation systems. Some of these are not referenced in the main body of the document.*

- **Distributed Interactive Simulation (DIS)**
  - IEEE 1278.1-1995 Application Protocols
  - IEEE 1278.1a-1998 Supplement to Application Protocols - Enumeration and Bit-encoded Values
  - IEEE 1278.2 - Communication Services and Profiles
  - IEEE 1278.3 - Exercise Management & Feedback (EMF) - Recommended Practice
  - SISO-REF-010-2006 DIS Enumerations
- **High Level Architecture (HLA)**
  - IEEE 1516-2000 Framework and Rules
  - IEEE 1516.1-2000 Federate Interface Specification
  - IEEE 1516.2-2000 Object Model Template (OMT) Specification
  - IEEE 1516.3-2003 Federation Development and Execution Process (FEDEP)
  - IEEE 1516.4-2007 Verification, Validation, and Accreditation of a Federation
  - IEEE 1516-2010 HLA "Evolved" Framework and Rules
  - IEEE 1516.1-2010 HLA "Evolved" Federate Interface Specification
  - IEEE 1516.2-2010 HLA "Evolved" Object Model Template (OMT) Specification
- **Real-time Platform Reference Federation Object Model (RPR-FOM)**
  - SISO-STD-001-1999: Guidance, Rationale, & Interoperability Modalities for the RPR FOM (GRIM 1.0)
  - SISO-STD-001.1-1999: Real-time Platform Reference Federation Object Model (RPR FOM 1.0)
  - RPR FOM v2.0 D17 FOM
  - RPR FOM v2.0 D17 GRIM
- SISO-STD-004-2004: Dynamic Link Compatible HLA API Standard for the HLA Interface
- Specification Version 1.3
- SISO-STD-004.1-2004: Dynamic Link Compatible HLA API Standard for the HLA Interface Specification (IEEE 1516.1 Version)
- NATO STANAG 4603
- IEEE P1703 Distributed Simulation Engineering and Execution Process (DSEEP)
- SISO-STD-002-2006: Standard for: Link16 Simulations
- SISO-STD-003-2006; Base Object Model (BOM) Template Specification (approved 8 May 06)
- SISO-STD-003.1-2006; Guide for BOM Use and Implementation (approved 8 May 06)
- SISO-STD-007-2008: Military Scenario Definition Language (MSDL)

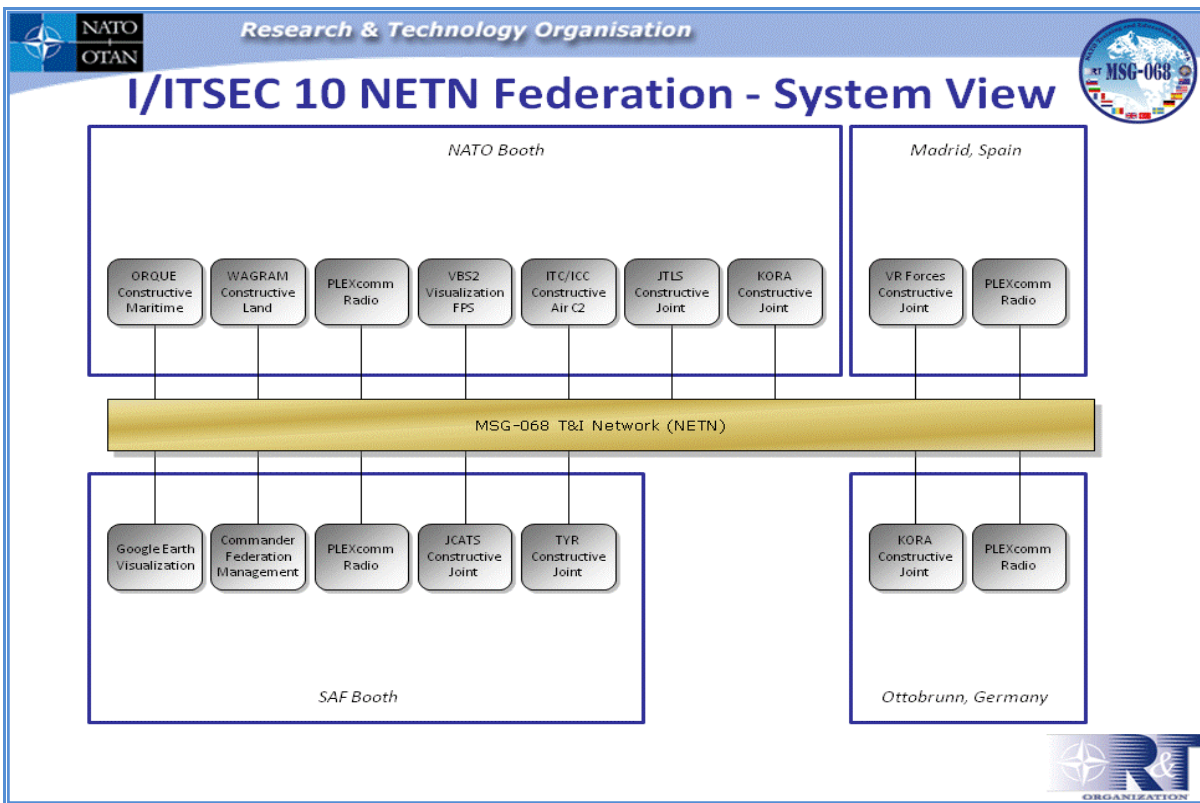
## 2 Design Agreements

Agreements related to the overall design of the federation shall be documented in the federation agreements. This includes information about the connected systems, their role and their purpose in the federation. A system can consist of several hardware and software components and each system can run in multiple instances.

System Name	Hardware	Software	Description	Purpose	POC
<Name and version>	<List of HW>	<List of SW>	<System Description>	<Purpose/Role in the Federation>	<POC information>
...					

For clarity, the federation agreements should also contain figures describing the main systems of the federation.

**Example:**





## 3 Infrastructure Agreements

### 3.1 CFBL-Net

The Combined Federated Battle-Lab Network (CFBL-net) is a core network component of the NETN Federation Architecture. This network provides a managed secure IP network used to connect accredited sites and national networks. However, the NETN Reference Federation Agreements document can also be applied to federations running on-top of other IP based networks including the Internet.

### 3.2 Booster Network

The NETN Federation Architecture recommends using a simulation overlay network (“Booster Network”) on-top of existing IP network to create a persistent capability to access and connect to the various simulation resources without the need for a specific technical setup or configuration. The Booster Network hides the complexity of the physical networking infrastructure, simplifies the federation setup and optimizes simulation performance over WAN by providing an HLA-aware software router. The NETN Reference Federation Agreements document does not explicitly require this technology and can also be applied to federations running without Booster Network.

Agreements on how the booster network is configured shall be documented in a table describing each node.

Name	Address	Location
<Logical Name of Booster>	<Public IP>	<Geographical Location or address>
...		

### 3.3 Sites

In NETN federations the unique identification of sites is a vital part of agreements related to the representation of simulated entities. A list of site IDs is therefore required to be completed as part of a federation specific FAD. The unique site identifier is also used as part of unique identifiers of simulated entities in the federation as defined in the RPR-FOM datatype “*EntityIdentifier*”.

### 3.4 IP Addresses

All systems connected to the network infrastructure shall be assigned IP addresses. The method for assigning these addresses can vary depending on the underlying network policies and procedures. A complete list of all IP addresses of all hosts involved in a specific experiment and their purpose must be listed in the Federation Specific FAD.

#### 3.4.1 IP addresses and Site Identifiers in CFBL-Net

The CFBL-Net formula for assigning IPs is straightforward and typically in the following format. From a CFBL-Net view each nation is given a 16 address block and National (NNN) id.

**Format: III.NNN.SSS.###**

- III is initiative id
- NNN is the national id
- SSS is the CFBL-Net site identifier

Each site shall correspond with a fixed IP range. The hosts on each site needed for the experiment shall get an IP address from this range. By using VPN technology all hosts in the network can be accessed by their IP address.

### 3.4.2 Site Identifier Reference

Sites connecting through CFBL-net are given a unique site identifier corresponding to the CFBL-Net IP setup. For all other federation agreements all sites identifiers should use the reference table below as the basis for assigning site identifiers. Only series of Site ID for nations participating in the development of this Reference Document have been included in this version of the reference agreements.

Site IDs should be in the range 1 – 65534

Site Name	Site ID	Site Description	Site Location
CFBL-net	0-255	Reserved for CFBL-Net sites allocated by CFBL-net authorities during initiative setup	
JWC	301	NATO Joint Warfare Center	Stavanger, Norway
JFTC	302	NATO Joint Force Training Center	Bydgoszcz, Poland
NC3A	303	NATO Command, Control and Consultation Agency	the Hague, the Netherlands
ESP NETN HUB	400 - 499	Series allocated for Spanish Sites	Spain
ITM Simulation Lab.	401	Institute of Technology "La Marañosa" Simulation Laboratory	Madrid, Spain
The Netherlands	500-599	Series allocated for Dutch Sites	The Netherlands
TNO	501	TNO	The Hague, Netherlands
Germany	600-699	Series allocated for German Sites	Germany
Sweden	700-799	Series allocated for Swedish Sites	Sweden
USA	800 - 899	Series allocated for US sites	USA
USJFCOM	801	US Joint Forces Command	Suffolk VA, USA
France	900-999	Series allocated to France	France
UK	1000-1099	Series allocated to UK	UK
Bulgaria	1100-1199	Series allocated to Bulgaria	Bulgaria
Hungary	1200-1299	Series allocated to Hungary	Hungary
Australia	1300-1399	Series allocated to Australia	Australia
Turkey	1400-1499	Series allocated to Turkey	Turkey
Romania	1500-1599	Series allocated to Romania	Romania

### 3.5 Simulation Infrastructure

NETN based federations are based on STANAG 4603 which states that High-Level Architecture (HLA) IEEE 1516 shall be used as the standard for developing and federating simulation systems. The NETN Reference Federation Agreements allows non-HLA or legacy HLA (i.e. HLA 1.3) federates to participate in the simulation using appropriate bridging and/or adapter technologies. NETN based federations use the latest version of IEEE 1516 (currently IEEE 1516-2010, a.k.a. HLA Evolved).

### 3.5.1 Federations and RTIs

A NETN based federation shall run a core federation based on an IEEE 1516 compliant and certified Runtime Infrastructure (RTI). Any bridging required in order to adapt federates to IEEE 1516 or the selected RTI shall be the responsibility of integrating federate.

This Reference FAD does not specify a specific RTI implementation for use in NETN based federations. Several certified RTI implementations exist that can provide the IEEE 1516 services to participating federates. In some cases multiple NETN based federations may exist and information between them exchanged using bridges/filters/guards etc.

All federations that exist to support an NETN federation execution must be clearly defined. Agreements related to the naming of federations, hosting of RTIs and specific details with respect to RTI settings must be declared as part of the federation specific agreements.

The following template shall be used to document all relevant federations including at minimum the primary HLA IEEE 1516 based NETN federation and supporting RTI.

Federation Name	RTI Version	RTI Host/Name	RTI Port	Comment	RID
<Name>	<Version>	<IP or Name of CRC>	<CRC Port>	<Description>	<RTI settings>

### 3.6 Federates

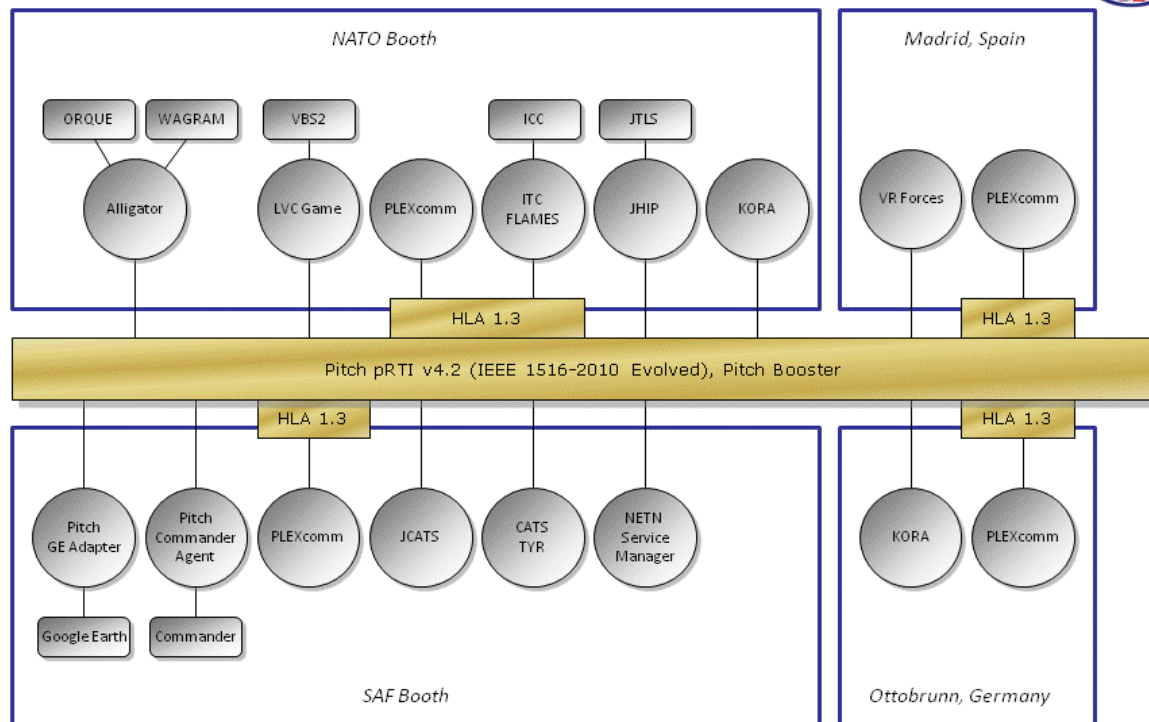
All federates participating in a NETN Federation must be clearly identified and described. Agreements with respect to federates include:

- Federate Name (used in HLA IEEE 1516-2010 based federations and may be different from federate type)
- Federate Type
- Federate Application Name and Id (name of the application hosting the federate, note that the same application can host several federates, e.g. a bridge application)
- Application ID – The application Id is used when exchanging information to create unique identifiers assigned to entities. The ID is used in the RPR-FOM datatype “*EntityIdentifier*”.
- Interface used to connect to the RTI (e.g. HLA 1.3, IEEE 1516-2010 ...)
- Federation Name (the name of the federation which the federate joins)
- Description (Information about the main role in the exercise and any additional important information)
- Federate POC (Org or person responsible for the federate)

Federate Name	Federate Type	Federate Application	Application ID	Interface	Federation Name	Description	POC
<Name>	<Version>	<App Name>	ID	<Interface>	<Federation>	<Description>	<POC info>

For clarity, a figure describing all federates connected in a federation (so-called lollipop picture) should be included in the federation agreements.

**Example:**



Each federate should also document their HLA interface in terms of which HLA services are used and which information is exchange in the federation. A Simulation Object Model (SOM), SOM Modules and/or other descriptions of the object model used to exchange information in the federation shall be clearly documented. HLA federate certification is recommended and may be required.

### 3.7 Supporting Software and Services

Simulation Support Services are processes (software) which must be executed in parallel to the federate processes to enable a federation execution or which is required to support individual simulations in the federation to enable them to participate in a federation according agreements.

NETN Reference Architecture does not include any specific Simulation Support services.

- All federates/simulations in a NETN based federation must specify any Simulation Support services used.
- The federation specific FAD shall document all Simulation Support services for all participating federates

#### Examples

- Local RTI Component (LRC) is an integral part of the Federate Application and is usually started in the same process space as the federate itself. Usually this service is not documented explicitly in the FAD unless the LRC does more than expected like loading a plug-in for SOM to FOM translation.
- Central RTI Component (CRC). Unless running a connectionless RTI mode this component represents the RTI Executive and is the initial point of access to a federation.
- Web Service Provider RTI Component (WSPRC) is an RTI component used when offering the RTI
- Services using the standard IEEE 1516 Web-Service API.

- Execution Control / starter daemons for remote start up of the CRC, federates / simulation applications, or the various database services that can be required to run a simulation.
- Bridging/gateway/adaptor services (either as a bi-directional transfer or as a data diode.)
  - HLA 1.3 <-> HLA IEEE 1516
  - FOM X <-> FOM Y
  - DIS <-> HLA
  - TENA <-> HLA
  - RTI X <-> RTI Y
  - SIMPLE <-> HLA LINK 16 BOM
- Databases to provide initialization data
- Web-services to provide initialization data
- Databases to provide weapon-system-parameters or material data

## 4 Information Exchange Agreements

### 4.1 Information Exchange Data Models

NETN Federations use the modular FOM concept defined in IEEE 1516-2010. The modules describe how data is represented and encoded/decoded when exchanged in an HLA federation. The modular concept allows federates to load only those modules they are aware of and use. In addition the modules can be extended with more detailed representation by creating new modules and sub-classing/using information from other modules.

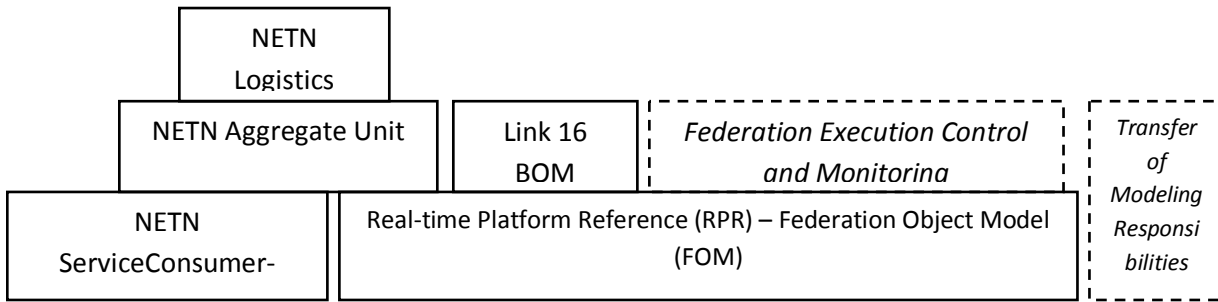
In an NETN federation agreement all federates shall be documented with respect to which FOM modules they use. In addition each federate shall also document a Simulation Object Model (SOM) describing in detail what parts of the FOM modules are used.

The NETN Reference Federation Agreements Document have developed and identified a set of FOM Modules to support some specific aspects of information exchange between federates in an NETN federation. Future versions of this document may include references to more and/or updated modules that represent other aspects currently not included in the scope of NETN Reference Architecture.

The NETN Reference FOM is a set of independent and dependent FOM Modules. Each FOM Module is either an already established standard maintained by other organizations/communities or defined as a NETN FOM Module.

The following FOM Modules versions constitute the current version 1.0 of the NETN Reference FOM:

FOM Module	Dependencies	Comment
RPR-FOM v2.0 D17 (r2)	Standalone	The RPR-FOM Module is based on the SISO RPR-FOM PDG release of RPR-FOM v2.0 D17.
Link 16 FOM Module v1.0 D2 (r2)	RPR-FOM v2.0 D17	The Link 16 FOM Module is based on the SISO Link16 PDG work and release of Link 16 BOM v1.0 Draft2.
NETN Service Consumer-Provider FOM Module v1.0	Standalone	The NETN Service Consumer-Provider FOM Module is a base-module intended to be extended to support the modeling of different types of services.
NETN Logistics FOM Module v1.0	NETN Service Consumer-Provider FOM Module v 1.0, NETN Aggregate FOM Module v1.0, RPR-FOM v2.0 D17	The NETN Logistics Module is used to model logistics services such as transport, supply and repair.
NETN Aggregate FOM Module v1.0	RPR-FOM v2.0 D17 (r2) NETN Service Consumer-Provider FOM Module v 1.0	The NETN Aggregate FOM Module extends the RPR-FOM representation of Aggregate and Platform entities.



All FOM modules can also be obtained as HLA IEEE-1516-2010 OMT Data Interchange Format files.

Federations may extend the reference FOM with additional FOM Modules when appropriate. The basic FOM Module rules as defined in IEEE 1516-2010 shall be applied.

The name of object- and interaction classes in FOM Modules developed specifically for NETN are prefixed **NETN\_**. When extending the FOM with additional modules the naming of classes, datatypes and other identifiers should be de-conflicted.

Registered objects and interactions are always discovered/received at the most specific subscribed class level. Extending a FOM Module with additional subclasses provides the possibility to add extra attributes/ parameters at the more specific class level. Exchange of information using this more specific level can take place between federates publishing and subscribing to this level. However, to become compatible with and receive information from federates only publishing on the more general level, the receiving federate must subscribe to both class levels. Subscribers of the more general class will receive information from publishers of the more specific class level.

Example: A national extension to the NETN FOM Modules subclasses existing NETN object classes and defines additional attributes. National models aware of this extension can publish and subscribe to the more specific level defined in the national FOM module extensions. Other existing federates not aware of the extension can still discover the object and receive updates but only on the level it subscribes to. In order for the national federates to discover and receive information from other federates they need to subscribe to the NETN class level as well as the national extension level. Be aware that the discovered object and attribute updates will be on the NETN level.

## 4.2 Platforms and Aggregate Units

Information about Platforms and Aggregate Units are exchanged in NETN Federations using the RPR-FOM v2.0 D17 FOM Module and extensions represented in the NETN Aggregate FOM Module v1.0.

The NETN Aggregate FOM Module v1.0 extends the representation available in the RPR-FOM with additional information enabling a higher level of interoperability between systems using these extensions. The NETN Aggregate FOM Module v1.0 is documented in chapter 9.

Mixing federates working on the basic RPR-FOM level with the more detailed NETN Aggregate FOM Module level is possible and allowed depending on the requirements of the federation in terms of interoperability. E.g. a federate only requiring RPR-FOM information can subscribe to information on that level while other federates exchange information on the NETN Aggregate FOM Module level.

### 4.2.1 Entity Identifier

In the federation agreements all known units and platforms shall have a unique identifier associated with the entity. In addition initial information about the state of the entity shall be documented. This includes

the following RPR-FOM and NETN Aggregate FOM Module information. Callsign (Who), Entity Type (What), Spatial (Where), Marking.

## **4.2.2 Entity Types**

The RPR-FOM also requires an agreement with respect to platform and aggregate unit entity types. A key attribute of simulated entities and units are that they have entity type identifiers. In RPR-FOM this is a 7 digit code representing the Kind, Domain, Country, Category, Subcategory, Specifics and Extra information to define the type of a platform or unit. There exists standards that document common platform and unit types however for a specific federation agreements related to Entity Types must be documented.

All known entity types that will be represented in the federation shall be defined and listed in the federation agreements. Federates supporting a subset of the identified types shall list those types supported.

## **4.2.3 Symbols**

In many federations there is a requirement to correlate the symbols used to represent platforms and units on 2D and/or 3D displays. Such agreements shall be documented in the federation agreements as mappings between Entity Types and Symbols. Other information required to map to symbols may be Forcelidentifier and unit size information.

## **4.3 Modeling Responsibilities**

In a federation the responsibility of modeling and simulation of the synthetic environment is distributed. Each federate have intrinsic capabilities to represent certain aspects of entities, events and other phenomenon in the simulated environment. During federation design the roles and responsibilities of all federates are described and documented. The responsibility of modeling certain aspects can only be assigned to a federate with a capability that meets specified requirements. Initial modeling responsibilities and capabilities of dynamically transferring modeling responsibilities shall be documented in the federation agreements.

### **4.3.1 Services Modeling**

The NETN Reference Federation Agreements includes FOM modules to federate to provide modeling and simulation as services to other federates. This is not a transfer of responsibility between federates but rather a service provided by one federate and consumed by another. The NETN Service-Consumer FOM Module v1.0 is a base module that allows federates to request, provide and consume services. In addition a NETN Logistics FOM module is provided specifically for logistics related services.

Services Modeling is the preferred method by which a federate transfers resources (Supply), transports (Convoy) and or provides maintenance (Repair) units and platforms simulated in another system.

The NETN Service-Consumer FOM Module is provided in chapter 7 and the NETN Logistics FOM Module is provided in chapter 8.

### **4.3.2 Dynamic Transfer of Modeling Responsibilities**

No design pattern for the dynamic transfer of modeling responsibilities has been verified as part of the MSG-068 NETN work and no such module is included in this document. However there exist proposals that may be included in future versions of this document.



#### ***4.4 Radio Simulation Agreements***

Radio simulation in NETN based federation shall use the RPR-FOM (DIS) Radio protocol/interactions.

## **5 RPR-FOM v2.0 D17 (r2) FOM Module**

The NETN Reference FOM and FAD are dependent on the Standard Real-Time Platform Reference FOM. The version used is currently under development by the Simulation Interoperability Standards Organization (SISO) in a Product Development Group (PDG). The version selected is widely used by industry and a well know de-facto standard.

Recommendations:

- Use the NETN Logistics FOM Module services approach and not the RPR-FOM logistics interactions
- Use the extended NETN Aggregate FOM Module representation of platforms and Aggregate Entities

## **6 Link 16 FOM Module**

The Link 16 FOM module is a derivative from the SISO-STD-002-2006: Standard for: Link16 Simulations (aka. Link16 BOM) and is dependent on the Standard Real-Time Platform Reference FOM.

The Link 16 BOM is available from SISO. It has been adapted to a FOM Module, dependent on the RPR-FOM v2.0.

## **7 NETN Service Consumer-Provider FOM Module**

### **7.1 Introduction**

This document describes a basic pattern for modeling request, negotiation and delivery of services. The interaction patterns required for different types of services may vary but the basic principles and interaction class definitions are outlined in this chapter.

In the RPR-FOM and DIS patterns exist to model logistics services. The intention is to allow these specific patterns to map onto the more general Service Consumer-Provider Pattern. This is described in more detailed in the Logistics FOM Module chapter.

The Service Consumer-Provider Pattern defines two types of entities.

- Service Consumer Entities: are entities requesting and consuming specific services offered and provided by other entities.
- Service Provider Entities: are entities able to offer and provide a specific service.

A provider/consumer entity can be of various kinds, e.g.:

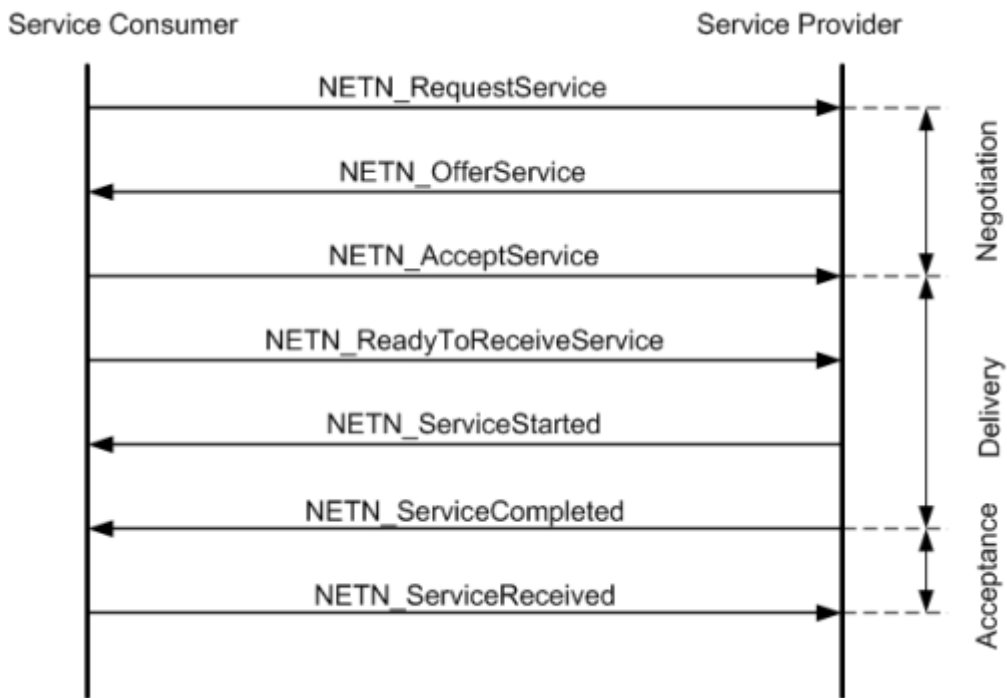
- An object instance in a federation execution
- A federate
- A controller of a function implemented in a federate application

The interactions between entities in this pattern will be published and sent using HLA services.

### **7.2 General Approach**

The pattern is divided into three phases:

1. Service Negotiation: the service is requested, offers received and offers are either accepted or rejected.
2. Service Delivery: the consumer indicates that it the deliver process can start and the selected provider start delivering and continues until all service has been delivered.
3. Service Acceptance: the provider or consumer indicates the completion of the service delivery and waits for acknowledgment/acceptance from the other part.



The above interaction diagram shows the normal patterns for requesting services and receiving notification that the service transaction has completed.

Variations include:

- Service completion is determined by the consuming entity and sent as a **NETN\_ServiceReceived** interaction before the corresponding **NETN\_ServiceCompleted** interaction is sent.
- The service offer (**NETN\_OfferService**) is NOT preceded by a service request. This accommodates cases in which a service provider determines that a service is needed by one or more consumers
- and offers that service before being asked

Exceptions include:

- Early termination of the service by either the consumer or provider using the **NETN\_CancelService**
- interaction
- Rejection of service offer by the service consumer entity using the **NETN\_RejectOffer** interaction.

Federation agreements:

The condition for offering a service based on information in the request is an agreement for a specific federation. This agreement shall be documented in the federation specific agreements using the following reference template:

Scope/type of request Condition for	Offering
All types of requests exactly	Ability to provide the type of service must match
<scope>	<condition>

Extending the RequestSupply and adding parameters with description of the conditions for offering may be a future extension, e.g. in a RequestSupply the requested supplies (amount, type) needs to be

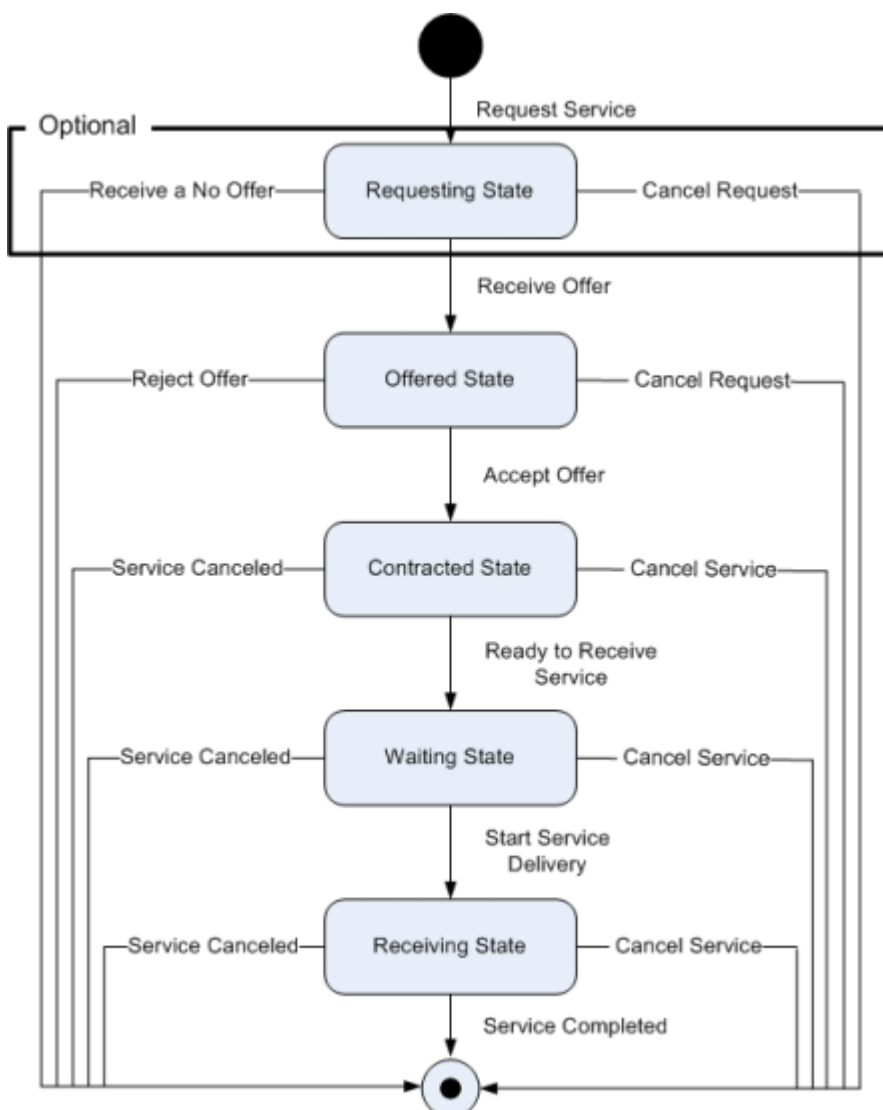
available by a producer in order to make an offer. On the other hand one might also consider providers making promises they know or don't know they cannot keep (like in real life).

### 7.2.1 Service Consumer

It is usually the service consumer that initiates a request for a specific service. A service consumer can be engaged in several concurrent service requests and deliveries. For each requested service the state of the service consumer can be described using a state-transition diagram (STD).

The Service Consumer entity may be in one of four states with respect to a requested service:

- **Requesting state.** A service consumer entity is in the Requesting State when it has requested a specific service from another entity
- **Offered state.** A service consumer entity is in the Offered State when an offer of the service delivery has been made by a service provider
- **Contracted state.** A service consumer entity is in the Contracted State when an offer has been accepted
- **Waiting State.** A service consumer is ready to receive the service and waiting for service delivery start
- **Receiving state.** A service consumer entity is in the Receiving State during service delivery

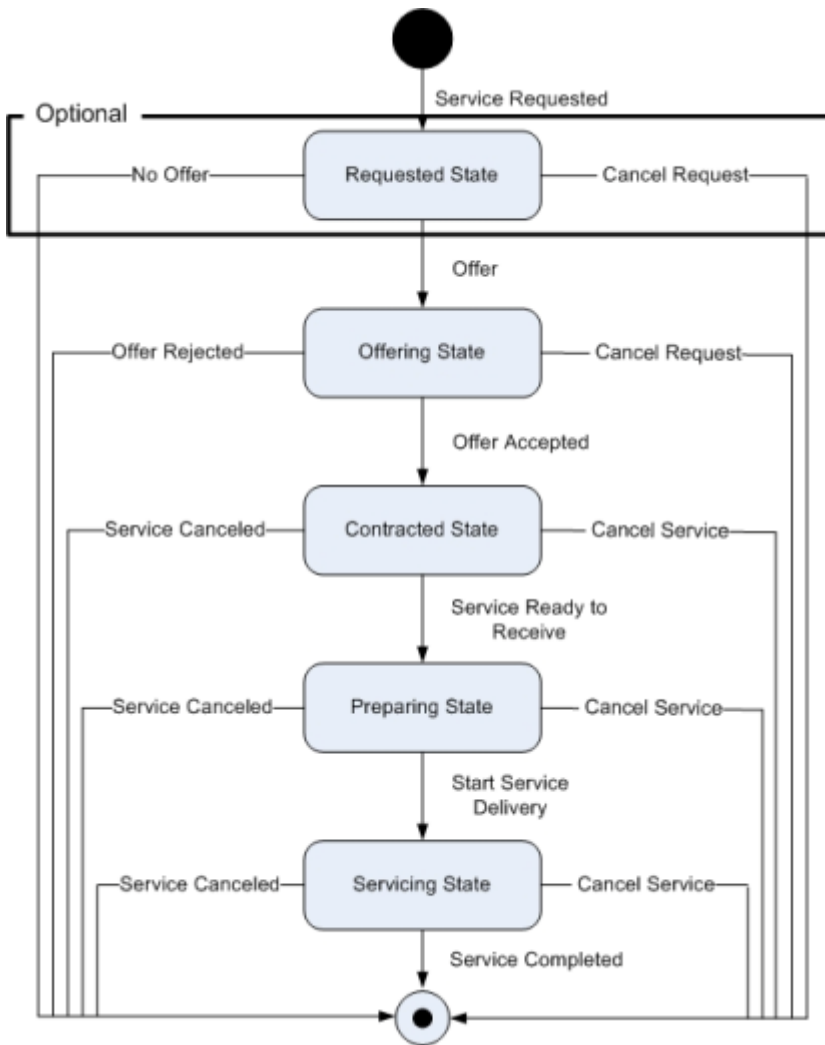


Transition	Condition and Actions
Request Service	When conditions for requesting a service are met, the consuming entity shall issue a NETN_RequestService interaction. The entity shall proceed from the Initial state to the Requesting state
Cancel Request	When conditions for requesting the services are no longer met a NETN_CancelService interaction is sent and the entity proceed from the Requesting state to the End state
Receive a no Offer	When a NETN_OfferService with a <i>NoOffer</i> indication is received, the entity shall proceed from the Requesting state to the End state
Receive Offer	When a NETN_OfferService with an <i>Offer</i> indication is received, the entity shall proceed from the Requesting state or Initial state to the Offered state
Reject Offer	When conditions for accepting a service offer are not met the service consuming entity shall issue a NETN_RejectOffer interaction and proceed to the End state
Accept Offer	Accept offer When conditions for accepting a service offer exists the service consuming entity shall issue a NETN_AcceptOffer interaction and proceed to the Contracted State
Ready to Receive Offer	When conditions for delivery of the service are met the service consuming entity shall issue a NETN_ReadyToReceiveOffer interaction and proceed to the Waiting State
Cancel Service	When conditions for receiving the services are no longer met a NETN_CancelService interaction is sent and the entity proceed to the End State
Service Canceled	When a NETN_CancelService interaction is received the service consuming entity shall proceed to the End State
Start Service Delivery	When an NETN_ServiceStarted interaction is received the service consuming entity shall proceed to the Receiving State
Service Completed	When a NETN_ServiceCompleted interaction is received or when the consuming entity determines that the conditions for service completed are met the NETN_ServiceReceived interaction shall be sent and the entity shall proceed to the End State

## 7.2.2 Service Provider

The Service Provider entity may be in one of four states with respect to a requested service:

- **Requested State.** A service producer entity is in the Requested State when it has received a request for a service from a service consumer entity
- **Offering State.** A service provider entity is in the Offering State when an offer in response to a requested service has been delivered to a service consumer
- **Contracted State.** A service provider entity is in the Contracted State when its offer has been accepted
- **Preparing State.** A service consumer has indicated it ready to receive the service, a service provider prepares the service delivery
- **Servicing state.** A service provider entity is in the Servicing state when a service is being delivered to a service consuming entity



Transition	Condition and Actions
Service Requested	When a NETN_RequestService is received the service providing entity shall proceed from the initial state to the Requested State
Cancel Request	When a NETN_CancelService interaction is received from a service consuming entity, the entity shall proceed from the Requested State to the End State
No Offer	When the conditions for delivering a requested service are not met, a NETN_OfferService with a <i>NoOffer</i> indication shall be sent and the service producing entity shall proceed to the End State
Offer	When the conditions for delivering a requested service are met, a NETN_OfferService including the offer shall be sent and the service producing entity shall proceed to the Offering State
Offer Rejected	When a NETN_RejectOffer is received the service producing entity shall proceed to the End State
Offer Accepted	When a NETN_AcceptOffer is received the service producing entity shall proceed to the Contracted State
Service Ready to Receive	When a NETN_ReadyToReceiveService is received the service producing entity shall proceed to the Preparing State
Cancel Service	When conditions for receiving the services are no longer met a NETN_CancelService interaction is sent and the entity proceed to the End state



Transition	Condition and Actions
Service Canceled	When conditions for providing the services are no longer met a NETN_CancelService interaction is sent and the entity proceed to the End state
Start Service Delivery	When the conditions for starting the service delivery is met, a NETN_ServiceStarted interaction is sent and the service providing entity proceeds to the Servicing state
Service Completed	When a NETN_ServiceReceived interaction is received or when the conditions for completed service delivery is met, a NETN_ServiceCompleted interaction is sent and the service producing entity proceeds to the End state

### 7.3 Interaction Classes

The Service Consumer-Provider Pattern defines a set of HLA interaction classes used to implement the three phases of the pattern. These interactions are provided as a FOM Module and can be extended to support specific service types.

Class 1	Class 2
NETN_Service	NETN_RequestService
	NETN_OfferService
	NETN_AcceptOffer
	NETN_RejectOffer
	NETN_CancelService
	NETN_ReadyToReceiveService
	NETN_ServiceStarted
	NETN_ServiceCompleted
	NETN_ServiceReceived

#### 7.3.1 NETN\_Service

The **NETN\_Service** interaction class is the base class for all NETN Service Consumer-Provider Pattern interactions. It contains the basic required parameters (not optional) that are always sent.

Full Name: **HLAinteractionRoot.NETN\_Service**

Parameter	Data type	Default value (if optional)	Definition
ServiceID	NETN_EventIdentifier	(Not Optional)	Unique identifier for a service
Consumer	NETN_Callsign	(Not Optional)	Requesting entity
Provider	NETN_Callsign	(Not Optional)	Providing or intended provider entity
ServiceType	NETN_ServiceTypeEnum8	(Not Optional)	Extension of RPR2 ServiceTypeEnum8

The NETN\_ServiceTypeEnum8 enumerated data type is an extension of the **ServiceTypeEnum8** defined in the RPR-FOM v2.0.

### 7.3.2 NETN\_RequestService

The request for a service is always initiated by a **NETN\_RequestService**. Subclasses of this interaction for specific types of services may include parameters for detailing the requirements of this request. This may include information when, where and how the service is to be delivered.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_RequestService**

Parameter	Data type	Default value (if optional)	Definition
RequestTimeOut	NETN_Integer64BE	0	Defined a deadline (date) for the provider response. Number of second since 01/01/1970. Default value zero (0) implies that the time out value has no meaning

### 7.3.3 NETN\_OfferService

The **NETN\_OfferService** is usually a response to a **NETN\_RequestService** and contains information with respect to the providing entities ability to deliver the requested service. This ability is expressed as either an offer to provide the service or no offer. Subclasses of this interaction for specific types of offers should contain more detailed description of the offer. This may include information about when, where, how the service can be delivered.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_OfferService**

Parameter	Data type	Default value (if optional)	Definition
IsOffering	HLAboolean	(Not Optional)	Defines if the requested service is offered (=true) or not (=false)
RequestTimeOut	NETN_Integer64BE	0	Defined a deadline (date) for the consumer response. Number of second since 01/01/1970. Default value zero (0) implies that the time out value has no meaning

### 7.3.4 NETN\_AcceptOffer

The **NETN\_AcceptOffer** is used to accept an offer made by a service providing entity as indicated in a **NETN\_OfferService** interaction. By issuing a **NETN\_AcceptOffer** interaction the service consuming entity enters a contract for service delivery with the service producing entity.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_AcceptOffer**

The **NETN\_AcceptOffer** interaction does not define any additional parameters but subclasses may include parameters with additional information.

### 7.3.5 NETN\_RejectOffer

The **NETN\_RejectOffer** is used to reject an offer made by a service providing entity as indicated in a **NETN\_OfferService** interaction. By issuing a **NETN\_RejectOffer** interaction the service consuming entity informs the providing entity that the offer has been rejected.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_RejectOffer**

The **NETN\_RejectOffer** interaction does not define any additional parameters but subclasses may include optional parameters for detailing the reasons for rejecting the service.

### 7.3.6 NETN\_CancelService

The **NETN\_CancelService** interaction is used by either a service consuming entity or a service providing entity to inform about early termination of the service delivery or in some cases termination of the service request before delivery has begun.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_CancelService**

The **NETN\_CancelService** interaction does not define any additional parameters but subclasses may include optional parameters for detailing the reasons for canceling the service.

### 7.3.7 NETN\_ReadyToReceiveService

The **NETN\_ReadyToReceiveService** interaction is issued by a service consuming entity to indicate that the start of service delivery can start. The time of service delivery start may be significantly later than indicating ready for service delivery.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_ReadyToReceiveService**

The **NETN\_ReadyToReceiveService** interaction does not define any additional parameters.

### 7.3.8 NETN\_ServiceStarted

The **NETN\_ServiceStarted** interaction is issued by a service providing entity to inform about the start of service delivery. The time of service delivery start may be significantly later than receiving an indication from the consumer that the service delivery can start.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_ServiceStarted**

The **NETN\_ServiceStarted** interaction does not define any additional parameters.

### 7.3.9 NETN\_ServiceCompleted

The **NETN\_ServiceCompleted** interaction is used by a service providing entity to inform the service consuming entity that the service has been delivered.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_ServiceCompleted**

The **NETN\_ServiceCompleted** interaction does not define any additional parameters.

### 7.3.10 NETN\_ServiceReceived

The **NETN\_ServiceReceived** interaction is used by a service consuming entity to inform the service providing entity that the service has been delivered.

Full Name: **HLAinteractionRoot.NETN\_Service.NETN\_ServiceReceived**

The **NETN\_ServiceReceived** interaction does not define any additional parameters.

## 7.4 Simple Datatypes

Name	Representation	Semantics
NETN_Integer64BE	HLAinteger64BE	
NETN_Integer32BE	HLAinteger32BE	
NETN_Integer16BE	HLAinteger16BE	

Name	Representation	Semantics
NETN_Float64BE	HLAfloat64BE	
NETN_Float32BE	HLAfloat32BE	

## 7.5 Arrays

Name	Representation	Encoding	Semantics
NETN_Callsign	HLAunicodeString	HLAvariableArray	

## 7.6 Fixed Records

### 7.6.1 NETN\_EventIdentifier

<b>Name</b>	NETN_EventIdentifier	
<b>Encoding</b>	HLAfixedRecord	
<b>Semantics</b>	-	
<b>Field Name</b>	<b>Type</b>	<b>Semantics</b>
EventCount	NETN_Integer32BE	
IssuingObjectIdentifier	NETN_Callsign	

## 7.7 Enumerated Datatypes

### 7.7.1 NETN\_ServiceTypeEnum8

<b>Name</b>	NETN_ServiceTypeEnum8	
<b>Representation</b>	HLAoctet	
<b>Semantics</b>	-	
<b>Enumeration</b>	<b>Value</b>	<b>Semantics</b>
Other	0	
Resupply	1	
Repair	2	
Storage	3	
Convoy	4	
CombatAdjudication	5	

## 8 NETN Logistics FOM Module v1.0

### 8.1 Scope

The NETN Logistics FOM Module is based on the NETN Service Consumer-Provider FOM Module with extensions to support specific logistics services as defined below. Detailed description on how these services map to the NETN Logistics interactions are included in this document.

The NETN Logistics FOM Module is also dependent on the RPR-FOM v2.0 due to the fact that several data types defined in the RPR-FOM are reused in the definition of parameters for logistics interactions.

In addition, a Transfer of Control pattern is introduced as an option for some logistics services. Extensions to existing RPR-FOM object classes are proposed.

The NETN Logistics FOM Module covers the following services:

- **Supply service** is provided by a facility, a unit or any battlefield entity with consumable materials supply capability
- **Storage service** is provided by a facility or means of transportation capable of storing consumable materials
- **Repair service** can be performed on equipment (i.e. non-consumables items such as platforms) by facilities or units capable of performing requested repairs. The repair service does not transfer the control of a damaged platform to the repairing facility
- **Transport service** provides a means of transport capable of storing and delivering non-consumable materials. Materials are embarked, transported and disembarked, with possible use of a Transfer of Control protocol
- **Embarkment service** provides a means of transport or a facility capable of storing non-consumable materials, with possible use of a Transfer of Control protocol
- **Disembarkment service** provides a means of transport or a facility capable of delivering non-consumable materials, with possible use of a Transfer of Control protocol

#### Examples of uses:

- Resupply of units (Consumer) by transportation means
- Supply of fixed wings in airports or during aerial refueling
- Supply of helicopter in assembly areas
- Transport of troops by train, ship and aircraft
- Repair of damaged platforms by a maintenance unit without changing platforms location
- Maintenance of damaged platforms previously deposited in a facility
- Embarkment and disembarkment of small or large units
- etc.

### 8.2 Definitions

Logistics supplies the troops with material and carries out maintenance.

Means of transport, transport resources and facilities for maintenance and storage are required for these tasks.

The term of **unit** will be used for individual platform entities as well as for aggregate entities.

## 8.2.1 Materials

Materials are differentiated between:

- Consumable materials
  - Ammunition
  - Mines
  - NBC Materials
  - Fuel (Diesel, Gas, Aviation fuel, etc.)
  - Water
  - Food
  - Medical materials
  - Spare parts
- Non-consumable materials
  - Vehicles
  - Aggregates
  - Reconnaissance and Artillery systems (Radar)
  - Missile

The NETN Reference Federation Agreements follows the RPR FOM convention by treating the above non-consumable materials as platform objects. Consumable materials, hereafter also referred to as supplies, differ from non-consumables in that the former can be transferred to a federation object, thereby "resupplying" that object with the appropriate consumable material. Consumable materials are further differentiated between piece goods and bulk goods (e.g. fuel, water, decontamination means). Material may therefore be requested as individual pieces (each), or in cubic meters for liquid bulk goods and kilograms for solid bulk goods.

The type of packaging (fuel in canisters, water in bottles, etc.) is not taken into account.

*Note: Many types of materials are often grouped together. Examples of this, taken from different simulations, are:*

- *Many artillery models do not distinguish between propellants, fuses, warheads, etc.*
- *Diesel, gas, and aviation fuel are grouped together under "Fuel".*
- *Medical material is only roughly divided into different classes.*
- *The supply of food and water is not represented in detail.*

Only damaged platforms will be delivered to maintenance (repair). The required effort for the repair of damaged material is determined by the provider model. It is calculated, based on the degree of damage to the material.

## 8.2.2 Means of transport

Depending on the federation, means of transport are published as platforms or as equipment of aggregate units. If transportation means are used as provider in the NETN Service Consumer-Provider pattern, they have to be published and registered as platform objects in the federation. This suggested approach does not require the publishing of the loading of the means.

For example, if a means of transport is to supply units, it then proceeds to a depot, or is itself a depot. Objects of other federates will then be supplied from the depot (supply facility).

### 8.2.3 Transport resources

The suggested transport resources are containers and flats. Depending on the federate agreements, resources can be published as platforms. If the transport resources are not exchanged between federates, they do not need to be published within the federation.

### 8.2.4 Facilities

Facilities are the central element through which material can be transferred. Facilities may be created during a simulation or may be a part of the infrastructure (railway station, storage tanks depot, port, etc.). A facility may be part of a unit (e.g. ship, etc.).

## 8.3 *Transfer of Control*

The main objective is to provide Transfer of Control mechanisms in support of NETN interactions between federates collaborating through logistics process.

### 8.3.1 Principles of Transfer of Control

Transfer of Control is optional depending on operational level of simulations:

- Some users will need to transport whole entities, including Aggregates units. It is often impossible to break down small units like platoons or sections.
- Some others will absolutely need to break down large units like brigades or battalions (often Aggregates), in order to make them transported and usable in more than one single position at the same time.

Therefore, the use of Transfer of Control as described in this Logistics FOM Module is not mandatory. Simulations will be able to cooperate with others, using logistics Convoy pattern without doing any Transfer of Control action.

In case of not using Transfer of Control, a transported unit remains **active** during transportation. So location of the transported unit remains at the embarkment location until disembarkment. Then, a jump of location at the disembarkment time occurs. That could cause an error because another unit could interact with the transported one, considering its embarkment position. Transportation can be made in one or several trips by one or several transporters.

The Transfer of Control protocol described here is **not an HLA service**.

From a Consumer point of view, Transfer of Control is limited because:

- The unit is transferred to the Provider, but the Consumer conserves its property. The Consumer is still in charge of updating the unit (position, operational status, consumptions, etc.) with obligation to declare an Active / Inactive status parameter (see below).
- The Consumer control on the transferred unit is limited to “passive” functions, e.g. supply or repair. Passive function implies no movement, combat or destruction.

There is no total only **limited Transfer of Control of an entity**. The control by the Provider applies only to some transferred elements (or sub-elements) of the unit.

Therefore, a transporter (here Provider) does not directly use the simulated object during transportation: entities or aggregates shall be represented by a structure that gives main characteristics of the embarked platform(s). This is the reason why a request for Convoy shall give a list of platforms (and their characteristics) to be transported. Transporter shall then manipulate this list during

transportation and on disembarkment a platform simulation shall build a new object that corresponds to the list.

### 8.3.2 Use of an Active / Inactive status parameter

Entities or aggregates shall have a status parameter that defines if they are “Active” or “Inactive” in the federation (the Logistics FOM Module extends all RPR-FOM Platform Object Classes with this parameter):

- “Active” is the default status of any element not transferred at initialization time. An “Active” element can react to the simulation environment.
- “Inactive” means that an element is not simulated. It does not react to the simulation environment, like a dead unit. Other federates following these agreements recognize its aggregate status as deactivated and should not try to interact. The HLA object of the “inactive” unit remains in the federation and models continue to subscribe to its HLA update.

### 8.3.3 Disaggregation of units during transportation

As transporters could generally not transport a large aggregate unit in one travel, the list of components of the aggregate to be transported (i.e.: list of the entities or sub-aggregates) should be managed by the consumer as non-divisible components.

The Consumer can provide a list of components (optional) to make the Transporter able to share this list in different means of transport, with obligation to transport all of it. If the list of components is not provided, the Transporter will consider the transportation of this whole unit, in order to accept or reject this service request.

From a Consumer point of view, to provide a list of components is recommended for units bigger than a platoon

Concerning **entities management**:

- **During Embarkment:** when a federate receives an EmbarkmentStatus, it must analyze the optional list of embarked objects. At this step, the consumer federate must set the entity (identified by a callsign) as inactive. The entity is no more taken into account in simulation.
- **During Disembarkment:** when a federate receives a DisembarkmentStatus, it must analyze the optional list of disembarked objects. If an object from the list is defined at entity level (see description of NETN\_ArrayOfObjectDefinition), an entity object shall be retrieved with the given callsign. Federate updates the entity status as active, and its location at Disembarkment position.
- **During Transport:** combination of the two previous items.

Concerning **aggregates management**:

- **During Embarkment:** when a federate receives an EmbarkmentStatus, it must analyze the optional list of embarked objects and identify those corresponding to aggregates, using callsigns. Federate can then go through the embarked objects list (see description of NETN\_ArrayOfObjectDefinition). This complete or partial list describes objects constituting the aggregate. At this step, federate has to update the aggregate representation by removing the identified objects from its internal list. When federate receives an EmbarkmentEnd interaction, and if all listed objects of the aggregate are removed, aggregate is set in an inactive state. Then, the aggregate could be removed from the federation.
- **During Disembarkment:** when a federate receives a DisembarkmentStatus, it must analyze the optional list of disembarked objects. If an object from the list is defined at aggregate level (see description of NETN\_ArrayOfObjectDefinition), it could be necessary to create a new aggregate object, defined as Bridgehead. It must be identified by a new callsign on the federation.
- **During Transport:** combination of the two previous items.



### 8.3.4 Representation of “Inactive” units

When the status of a unit is set as « Inactive » the recommended representation in systems reflecting the unit is to not display an object (hidden).

### 8.3.5 Representation of “Active” units

When the status of a unit is set as « Active » the object shall be displayed in the systems reflecting the unit.

As the same aggregate entity can simultaneously exist in several locations, multiple representations have to be managed by the simulations. To ensure its membership to the same units in shared Order of Battle, simulations have to use similar callsign for different representations of a same unit.

For multiple naming, see section [Transport by several transporters in several travels with ToC](#).

For multiple representations, see illustration in section [Illustration](#).

A unit single representation during transportation is also possible:

- Using a non non-divisible unit (no available information on content, or too small unit to be divided),
- Using a transport in one travel by one single transporter (with or without Transfer of Control).

For a multiple represented unit; addition of its different potentials should not exceed 100% for a same item.

### 8.3.6 Example: Transport by one single transporter in one travel with ToC

In this case, the provider is able to transport a complete unit (from the consumer) using one single transporter (boat, aircraft, train) and doing one single trip.

The transported unit is deactivated at the embarkment time and reactivated at the disembarkment location at the right time.

If the transporter is destroyed, the consumer service is cancelled and the transported unit is never reactivated.

### 8.3.7 Example: Transport by several transporters in several travels with ToC

In this case, a transported unit transfers a list of platform entities for each transporter. This seems to be equivalent to a transfer of equipments for Supply pattern. For each embarkment event, a NETN aggregate object update is published by the transported unit.

If there are no more platform entities to transport, the transported unit is deactivated (aggregate status attribute to inactive).

If the transported unit is still active (because embarkment is not completed) when a disembarkment occurs, a temporary Bridgehead unit is activated at the disembarkment location. It uses a new HLA ID and the same callsign than the transported unit, but with an extension (-bh).

For each disembarkment event, embarked platform entities are transferred toward a Bridgehead unit.








When the transported unit is no longer active (transport service is completed), the Bridgehead unit is suppressed and the original unit replaces it at the same location.

If a transporter is destroyed with transported units onboard, consumer service continues until service completion by other transporters.

Only one Bridgehead and one Disembarkment location per transported unit is supported.

### 8.3.8 Illustration

The following scheme illustrates a transport by several transporters (boats) in several travels, with Transfer of Control and multiple representation aspect.

	Consumer	Provider	Consumer
<b>Step 1</b>	 n platform entities ID 1 + callsign XXX <b>Active</b>		
<b>Step 2</b>	 ↓ platform entities ID 1 + callsign XXX <b>Active</b>		 <b>Bridgehead</b> ↑ platform entities ID 2 + callsign XXX-bh <b>Active</b>
<b>Step 3</b>	<b>Active → Inactive</b>		 n platform entities ID 1 + callsign XXX <b>Active</b>

## 8.4 Supply Pattern

Services for resupply of consumable materials include:

- **Supply service** provided by a facility, a unit or any battlefield entity with consumable materials supply capability,
- **Storage service** provided by a facility or means of transportation capable of storing consumable materials.

These two services are different in terms of flow of materials between service consumer and provider. In the supply service, materials are transferred from the service provider to the service consumer. In the storage service, the user of the storage facility necessarily has material which requires storage, thus the materials are transferred from the service consumer (e.g. a transport arriving at a depot) to the service provider (e.g. the storage facility) using the storage service.

Both services follow the basic NETN Service Consumer-Provider pattern to establish a service contract and a service delivery.

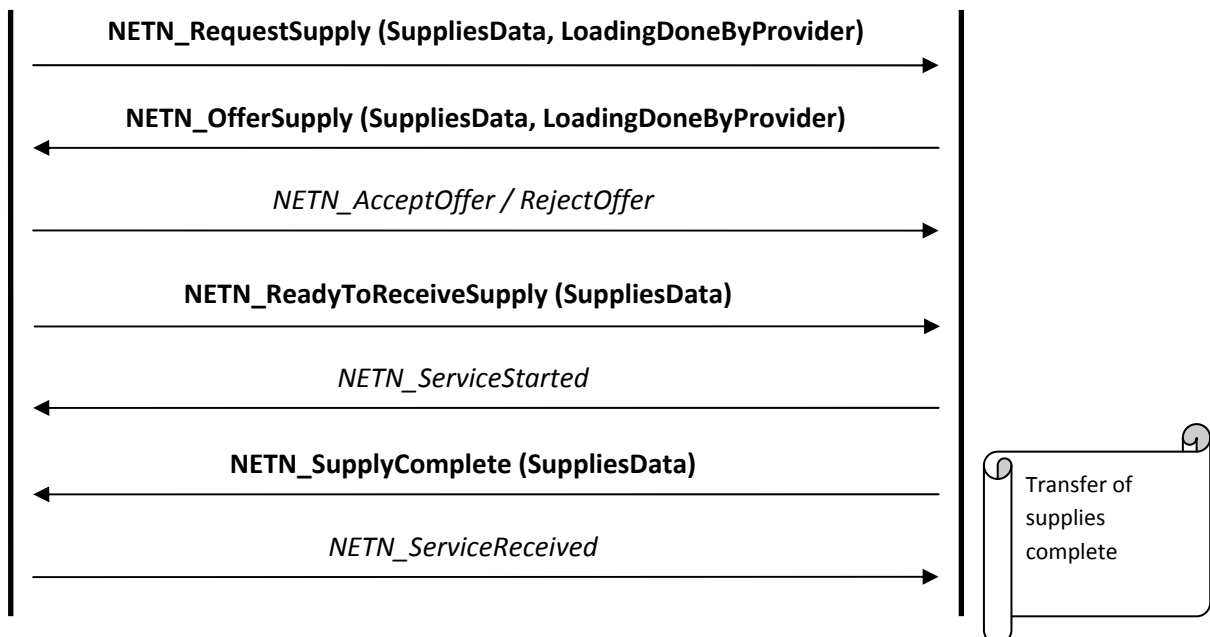
Materials will be transferred after the offer is accepted and the service is started. This pattern allows partial transfers. This means that only some of the materials described in the service contract are transferred. If the service is cancelled during service delivery, the provider must inform the consumer of the amount and type of material transferred.

If requested materials are only partially transferred in the NETN\_ServiceStarted interaction, the consumer has to start another NETN\_RequestSupply in order to obtain all desired supplies.

### 8.4.1 Supply Service

**Consumer**

**Provider**



**NETN\_RequestSupply** is used by a consumer to initiate a request for supply from a supply service provider. Amount and type of materials are included in the request. In this request, the consumer specifies a preference for whether the loading is done by the provider or by the consumer.

**NETN\_OfferSupply** is used by a supply service provider to indicate which of the requested materials (amount and type) can be offered. In this offer the provider can agree with the consumer's loading request or counter-offer based on current loading capability.

**NETN\_ReadyToReceiveSupply** is used by a service consumer to indicate that supply delivery may start. It also updates the requested amount of supplies based on the consumer's current supply requirements at the time the consumer is ready to receive supplies. Note that the updated supply amount(s) are subject to the constraint that the amount(s), by type, must be less than or equal to the amount(s), by type, of offered supplies.

**NETN\_SupplyComplete** is used by the service provider to inform the consumer of the amount, by type, of supplies transferred. This allows for supply pattern interruptions due to operational necessity, death/destruction of either the consumer or provider during resupply, etc.

Transfer of materials in supply service is considered as complete when:

- The service consumer receives a NETN\_SupplyComplete interaction **and**
- The service provider receives a NETN\_ServiceReceived interaction.

If the time specified in the *RequestTimeout* parameter of the NETN\_RequestSupply passes without the Provider sending a NETN\_OfferSupply, the Consumer **shall** send a NETN\_CancelService. The Consumer may then again initiate a NETN\_RequestSupply interaction.

The **LoadingDoneByProvider** parameter is used by the consumer to propose whether the loading is done by him or by equipment belonging to the facility; the provider can agree or disagree with the consumer's proposal.

When ready to receive, the consumer can indicate a modified SuppliesData to include fewer/less supplies than offered by the provider. Note that NETN\_ReadyToReceiveSupplies.SuppliesData must be less than or equal to the NETN\_OfferSupply.SuppliesData amount.

The provider can transfer only a part of the offered materials (partial transfer); the actual transferred supplies are identified in SuppliesData parameter of the NETN\_SupplyComplete interaction.

The consuming entity shall issue a NETN\_ServiceReceived in response to the NETN\_SupplyComplete interaction. Transfer of supplies is considered as complete once the NETN\_ServiceReceived is issued.

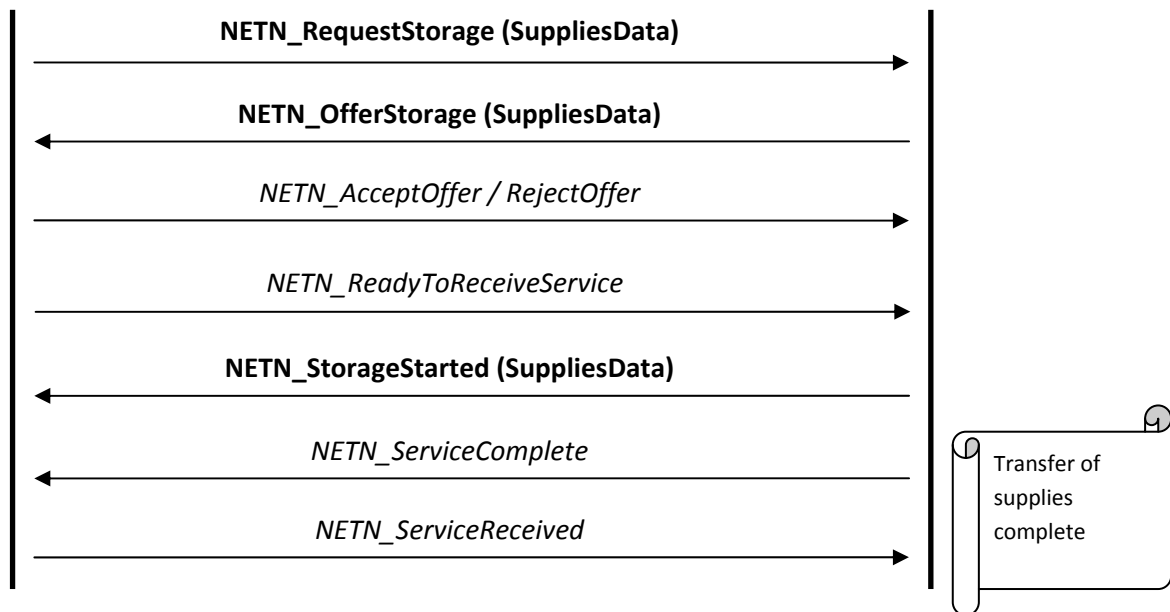
Early termination of the service request or delivery (as defined in the Service Consumer-Provider Pattern) is possible by either consumer or provider initiating a NETN\_CancelService. If the NETN\_CancelService occurs between NETN\_ServiceStarted and NETN\_SupplyComplete, the provider will inform the consumer of the amount of supplies transferred using NETN\_SupplyComplete.SuppliesData.

Rejection of a service offer is allowed. In this case, no material will be transferred.

## 8.4.2 Storage Service

**Consumer**

**Provider**



**NETN\_RequestStorage** is used by a consumer to initiate a request for storage of supplies. Amount and type of materials are included in the request.

**NETN\_OfferStorage** is used by a storage service provider to indicate which (amount and type) of the requested materials can be stored.

**NETN\_StorageStarted** is used by a service provider to indicate that the (partial) storage of requested materials has started.

The consuming entity shall issue a **NETN\_ServiceReceived** as response to the **NETN\_ServiceCompleted** interaction. Transfer of supplies is considered as complete once the **NETN\_ServiceReceived** is issued.

The consumer determines whether the loading is done by him or by equipments belonging to the facility.

The storage provider can limit the transfer of supplies to a subset of the offered supplies when issuing the **NETN\_StorageStarted** interaction.

Early termination of the service request or delivery (as defined in the Service Consumer-Provider Pattern) is possible. On early termination, no materials will be transferred.

Rejection of a service offer is allowed. In this case, no materials will be transferred.

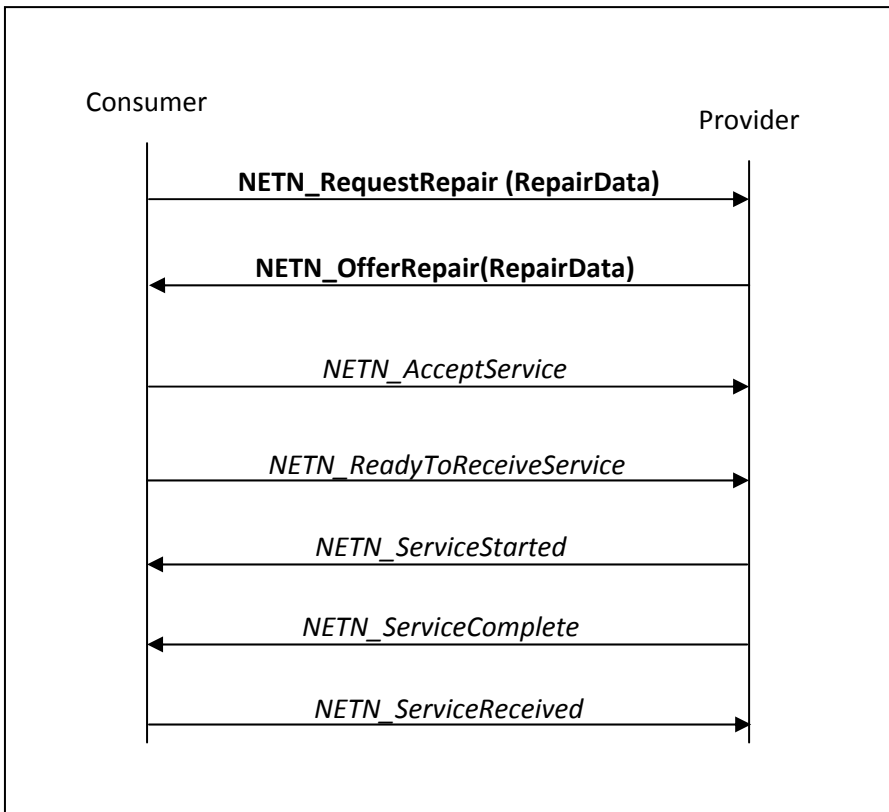
## 8.5 Maintenance Pattern

### 8.5.1 Repair Service

**Repair service** can be performed on equipments (i.e. non-consumables items such as platforms). Providers of this service are facilities capable of performing requested repairs.

The service is initiated by a **NETN\_RequestRepair** interaction, sent by a federate modelling the owner of damaged equipments (for example damaged platforms). The service-provider offer the repair service by sending the **NETN\_OfferRepair** interaction. The NETN Service Consumer-Provider interactions are used to complete the service.

Note: The maintenance pattern does not include a transfer of control of the damaged platform to the repairing facility. If such a transfer was required, the consumer should initiate a request for deposit (instead of request for repair) with an attached work order describing the required repairs.



The RepairData parameter is a list of equipments and type of repairs. List of offered repairs may be different from the list of requested repairs. If the HLA object (equipment to be repaired) has a damaged state, the list of requested repairs could be empty.

The provider federate models the efforts to repair a damaged platform.

If the consuming entity is an aggregate entity, its damaged equipment has to be listed in a platform list to get repaired.

## 8.5.2 Repair Types

The *RepairTypeEnum16* enumerated data type is defined in the RPR-FOM v2.0 and identifies a large set of repair types. DIS does not define the enumerated values as part of the core specification. Enumerated values are defined in a separate agreements document instead.

In the RPR-FOM however values are defined as a fixed part of some enumerated data types. In order not to violate the modular FOM merging rules, the NETN Logistics FOM module does not define any extensions to these data types as part of the FOM module. A separate table for adding values to the existing range of enumerations defined in the RPR-FOM is allowed instead.

This table shall be part of any federation specific agreements where extensions to an enumerated data type are required. It is also recommended but not required that any additional enumerated values added to this data type shall be submitted as Change Requests to the SISO RPR-FOM Product Development Group. All existing enumerators in RPR-FOMv2.0 and their values are reserved. Additional repair types are documented in the federation specific agreements.

## 8.6 Convoy Pattern

Convoy services are used in any cases covering management or transport of non-consumable materials such as platforms, units or battlefield entities.

Services for Convoy include:

- **Transport service** provided by a means of transportation capable of storing and delivering non-consumable materials.
- **Embarkment service** provided by a means of transportation capable of storing non-consumable materials.
- **Disembarkment service** provided by a means of transportation capable of delivering non-consumable materials.

Both Embarkment and Disembarkment services could also be extended to management of facilities; with the capability of delivering and storing non-consumable materials to/from other facilities, units or battlefield entities.

Convoy services include a “Transfer of Control” mechanism between a service consumer and a service provider over the unit managed by the means of transportation (see section Transfer of Control).

Convoy services differ in terms of the flow of units between service consumer and service provider:

- In Disembarkment service, units are transferred from a service provider to a service consumer.
- In Embarkment service, units are transferred from a service consumer to a service provider.
- In Transport service, both types of units transfer (generated by Embarkment and Disembarkment services) exist.

All convoy services follow the basic NETN Service Consumer-Provider pattern for establishing a service contract and a service delivery. The following interaction classes are extensions of the NETN Service Consumer-Provider interactions:

- **NETN\_RequestConvoy** interaction is used by a consumer to initiate a request of convoy to a convoy service provider. Convoyed units and constraints are included in the request.
- **NETN\_OfferConvoy** interaction is used by a convoy service provider to indicate which of the requested units can be managed. In this offer, a provider can change the constraints specified in the request and propose to manage only a part of asked units.
- **NETN\_RejectOfferConvoy** interaction is used by a service consumer to signify his disagreement to the provider about the proposal. Consumer can indicate the reason of his reject.
- **NETN\_CancelConvoy** interaction is used by a service consumer or a service provider to cancel the negotiated convoy service. The reason of the cancel can be indicated.

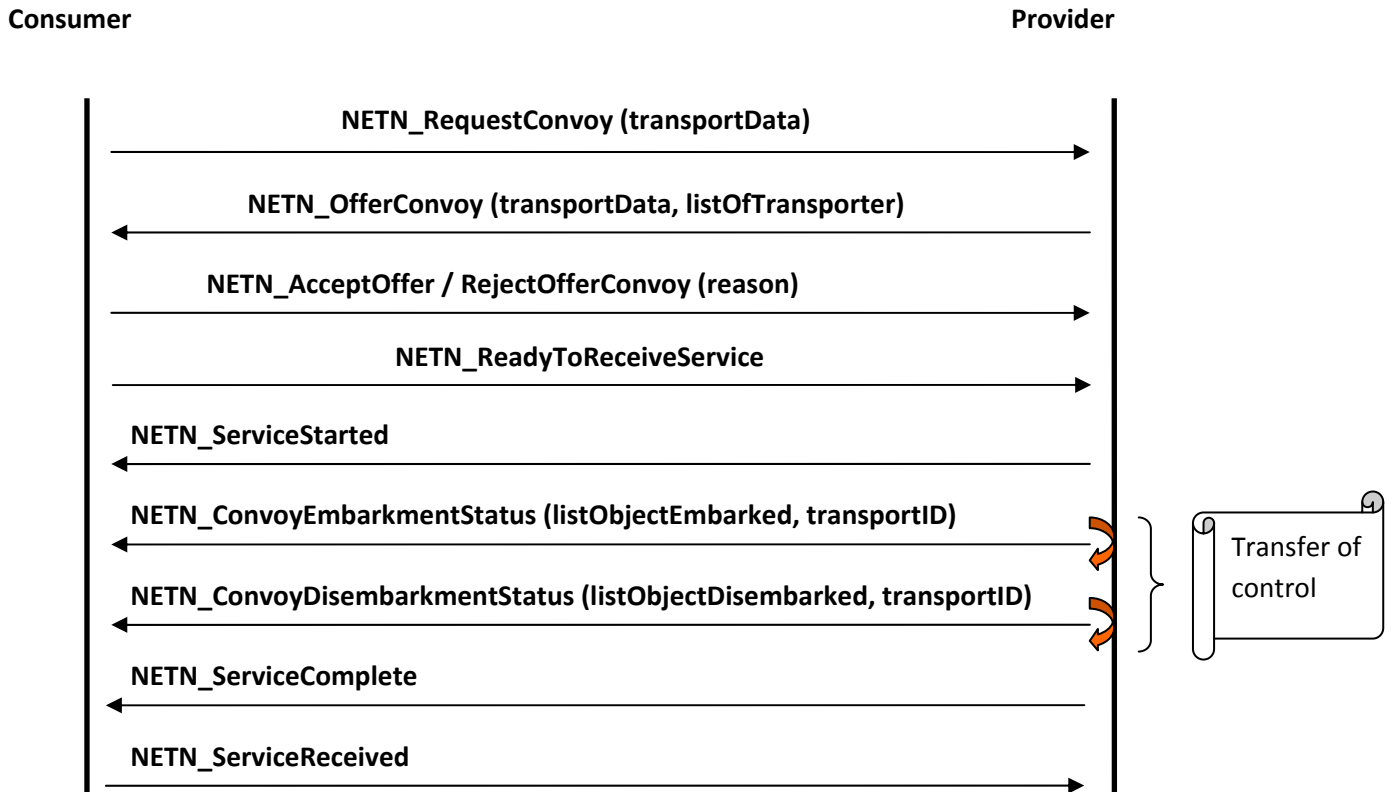
During Convoy services execution, a service provider can inform a service consumer about the service progress using the following interactions:

- **NETN\_ConvoyEmbarkmentStatus** interaction is used by a service provider to indicate precisely when units are embarked, so when ToC is applied.
- **NETN\_ConvoyDisembarkmentStatus** interaction is used by a service provider to indicate precisely when units are disembarked, so when ToC is restored.
- **NETN\_ConvoyDestroyedEntities** interaction is used by a service provider to indicate the damage state of unit during the ToC.

The following NETN Service Consumer-Provider interactions are also used in Convoy pattern:

- NETN\_AcceptOffer
- NETN\_ReadyToReceiveService
- NETN\_ServiceStarted
- NETN\_ServiceComplete
- NETN\_ServiceReceived

### 8.6.1 Transport service



A Consumer makes a request for transport with the following data:

- Time and location where units would like to embark and disembark,
- Characteristics of each simulated entity to manage,

A Provider offers a response to the consumer with the following parameters:

- Time and location where units could embark and disembark,
- List of simulated entities the Provider is able to manage and transport units planned to be used,

Offered services are accepted only when both service Consumer and Provider are agreeing about the conditions for delivery the service. Provider can change some elements of the request in this offer:

- Time and location where units must be embarked and disembarked, if the requirements of the request cannot be satisfied.
- Partial delivery offer by managing fewer units than requested.

To achieve Transport service, Consumer must be present on time at the meeting point in order to embark and publish the NETN\_ReadyToReceiveService interaction.

During a Transport service execution, each transporter enters a loop where:



- It publishes a list of embarked units. The responsibility of units specified in this list is transferred to the Provider until disembarkment (see section Transfer of Control)
- It publishes a list of disembarked entities. The responsibility of entities specified in this list is restored to the Consumer when disembarked (see section Transfer of Control)

Both **NETN\_ConvoyEmbarkmentStatus** and **NETN\_ConvoyDisembarkmentStatus** interactions can be repeated as much as needed, if transportation needs to be realized in several iterations.

A Transport service is considered as closed:

- When service Provider receives a **NETN\_ServiceReceived** interaction and service Consumer receives a **NETN\_ServiceCompleted** interaction.
- Or when a **NETN\_CancelConvoy** or a **NETN\_RejectOfferConvoy** is used by the service Provider or Consumer.

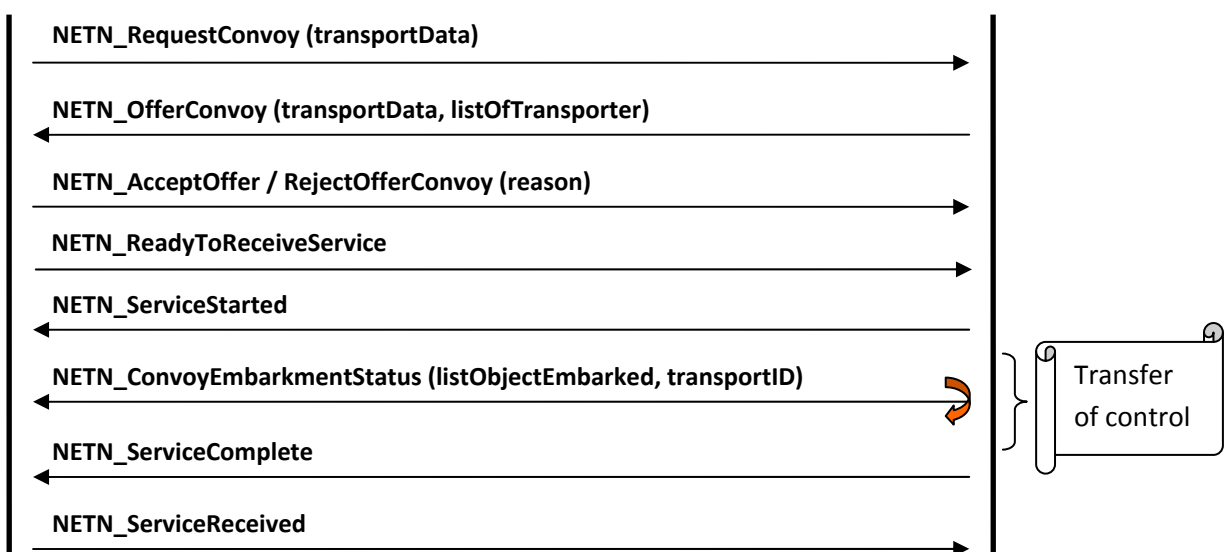
If a Transport service is cancelled:

- During a delivery phase (between start and complete):
  - All units already embarked or partially embarked are kept by the service Provider. A new Request is needed by the service Provider to continue to embark or disembark units (restore).
  - All units already disembarked or partially disembarked are kept by the service Consumer. A new Request is needed by the service Provider to continue to disembark or re-embark units (restore).
- During a negotiation phase (before start): transaction between service Consumer and Provider is considered as closed without delivery of service.
- After a service delivery (after complete): a cancel does not make sense in this case (no effect).

## 8.6.2 Embarkment service

**Consumer**

**Provider**



A Consumer makes a request for embarkment with the following parameters:

- Time and location where units would like to embark,
- Characteristics of each simulated entity to manage,

A Provider offers a response to the Consumer with the following parameters:

- Time and location where units could embark,
- List of simulated entities the Provider is able to manage and transport units planned to be used,

Offered services are accepted only when both service Consumer and Provider are agreeing about the conditions for delivery the service. Provider can change some elements of the request in this offer:

- Time and location where units must be embarked, if the requirements of the request cannot be satisfied.
- Partial delivery offer by managing fewer units than requested.

To achieve Embarkment service, Consumer must be present on time at the meeting point in order to embark and publish the `NETN_ReadyToReceiveService` interaction.

During an Embarkment service execution, each transporter enters a loop publishing a list of embarked units. The responsibility of units specified in this list is transferred to the Provider and never given back to the Consumer in this protocol (see section Transfer of Control).

A `NETN_ConvoyEmbarkmentStatus` interaction can be repeated as much as needed, if embarkment needs to be realized in several iterations.

An Embarkment service is considered as closed:

- When service Provider receives a `NETN_ServiceReceived` interaction and service Consumer receives a `NETN_ServiceCompleted` interaction.
- Or when a `NETN_CancelConvoy` or a `NETN_RejectOfferConvoy` is used by the service Provider or Consumer.

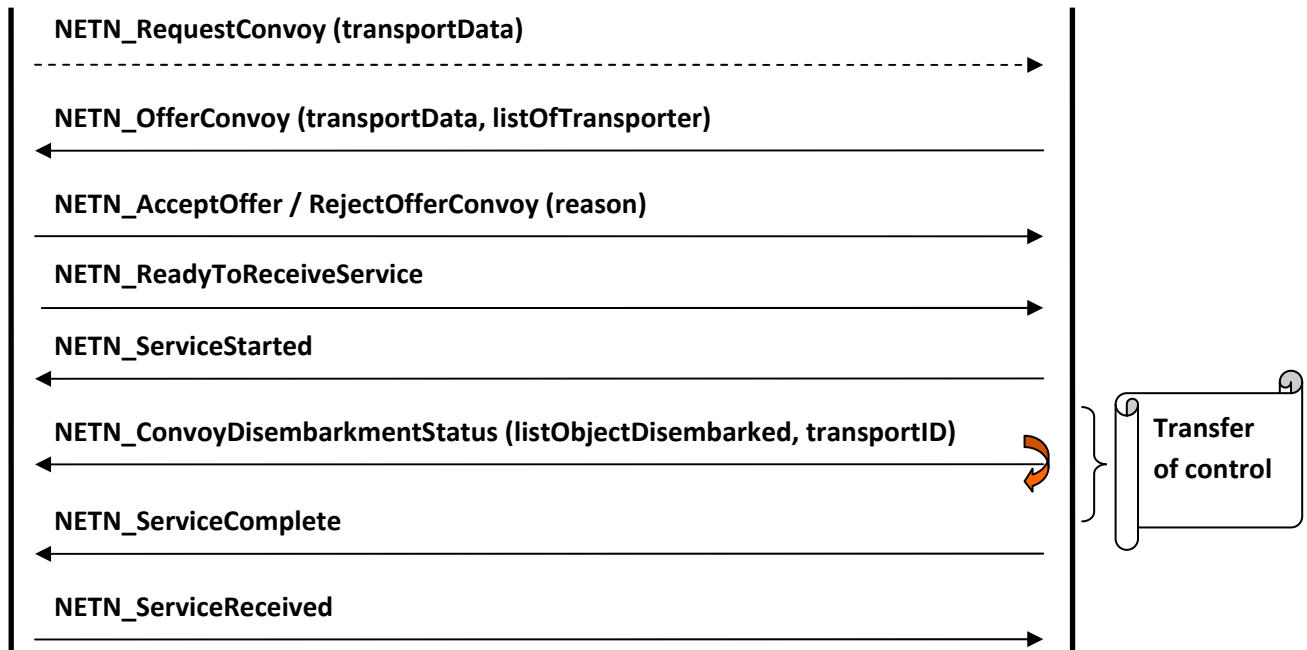
If an Embarkment service is cancelled:

- During a delivery phase (between start and complete): all units already embarked or partially embarked are kept by the service Provider. The status of this units stay as Inactive. A new Request is needed by the service Provider to continue to embark or disembark units (restore).
- During a negotiation phase (before start): transaction between service Consumer and Provider is considered as closed without delivery of service.
- After a service delivery (after complete): a cancel does not make sense in this case (no effect).

### 8.6.3 Disembarkment service

Consumer

Provider



A Consumer makes a request for disembarkment with the following parameters:

- Time and location where units would like to disembark,
- Characteristics of each simulated entity to manage,

A Provider offers a response to the Consumer with the following parameters:

- Time and location where units could disembark,
- List of simulated entities the Provider is able to manage and transport units planned to be used,

Offered services are accepted only when both service Consumer and Provider are agreeing about the conditions for delivery the service. Provider can change some elements of the request in this offer:

- Time and location where units must be disembarked, if the requirements of the request cannot be satisfied.
- Partial delivery offer by managing fewer units than requested

To achieve Disembarkment service, Consumer must publish the **NETN\_ReadyToReceiveService** interaction.

During a Disembarkment service execution, each transporter enters a loop where it publishes a list of disembarked entities. The responsibility of entities specified in this list is restored to the Consumer when disembarked (see section Transfer of Control).

A **NETN\_ConvoyDisembarkmentStatus** interaction can be repeated as much as needed, if embarkment needs to be realized in several iterations.

A Disembarkment service is considered as closed:

- When service Provider receives a NETN\_ServiceReceived interaction and service Consumer receives a NETN\_ServiceCompleted interaction.
- Or when a NETN\_CancelConvoy or a NETN\_RejectOfferConvoy is used by the service Provider or Consumer.

If a Disembarkment service is cancelled:

- During a delivery phase (between start and complete): all units already disembarked or partially disembarked are kept by the service Consumer. A new Request is needed by the service Provider to continue to disembark or re-embark units (restore).
- During a negotiation phase (before start): transaction between service Consumer and Provider is considered as closed without delivery of service.
- After a service delivery (after complete): a cancel does not make sense in this case (no effect).

Variations:

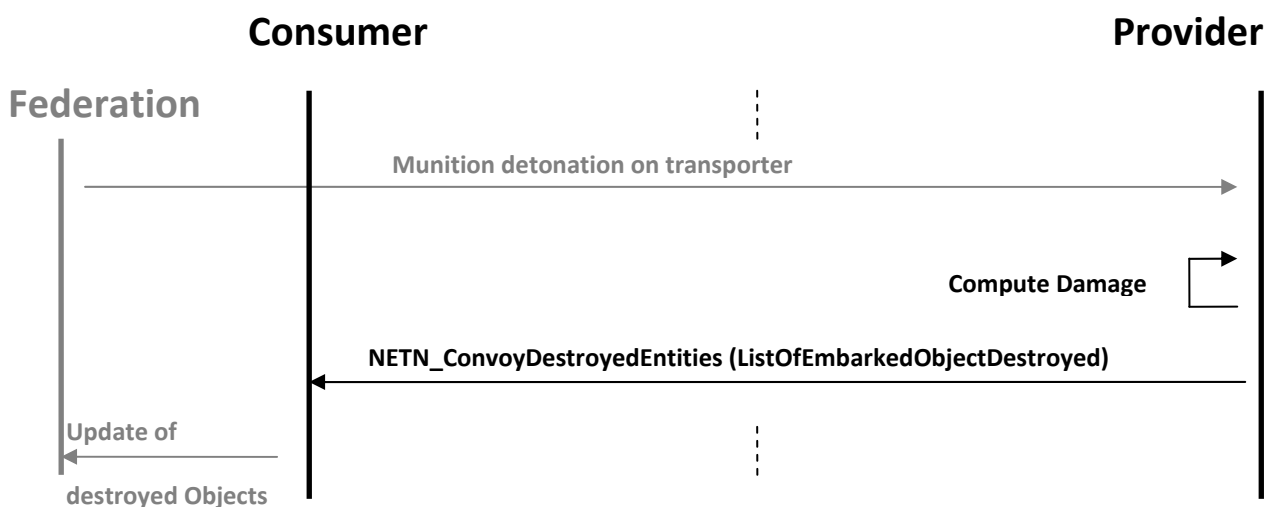
- Disembarkment protocol can start with a Consumer interaction as well as with a Provider one. If a Provider initiates a Disembarkment (planned operation), the protocol execution starts directly at the second step (NETN\_OfferConvoy), without processing the query phase (NETN\_RequestConvoy).

Exception: see section Scenario Preparation Phase.

In case of "scenario preparation phase", Disembarkment pattern could be affect. The case is detail at the end of this document.

### 8.6.4 Convoy Services and Attrition

During the execution of a Convoy service transporter may be engaged by other units or otherwise affected by the simulated environment. This attrition can affect the delivery of the service and requires additional interactions to notify service consumers about any lost/destroyed entities.



A Convoy service Provider can use a **NETN\_ConvoyDestroyedEntities** interaction to define transported units destroyed during the service execution and inform the Consumer.

For example, if a transporter is destroyed with transported units on board, transported entities are also destroyed. Therefore, whenever a convoy service provider receives interactions (e.g.

MunitionDetonation) attrition on embarked entities is calculated. The Convoy service Provider then sends a list of destroyed objects to the service consumer. The Convoy service consumer can use this list to update its situation or to cancel transaction in progress.

The **NETN\_ConvoyDestroyedEntities** interaction can take place at anytime between the start of the service (ServiceStarted interaction) and the end of the service (ServiceComplete interaction).

Impact on the Convoy service Pattern could be the following:

Ex: Vessel « 1 » and « 2 » must be transporters. Some units need to be transported in two rotations on each Vessel. We study the case where Vessel « 1 » is destroyed during its first rotation and Vessel « 2 » is destroyed during its second rotation:

Stage	Interactions
Negotiation phase and start of the service	...
First rotation:Vessel 1 and Vessel 2 embark units	<b>Provider send:</b> <b>NETN_ConvoyEmbarkmentStatus (list1, Vessel1)</b> <b>NETN_ConvoyEmbarkmentStatus (list2, Vessel2)</b>
During transport, service Provider received MunitionDetonation Vessel 1 is destroyed	<b>Provider send:</b> <b>NETN_ConvoyDestroyedEntities (list1)</b>
Vessel 2 disembark his units	<b>Provider send:</b> <b>NETN_ConvoyDisembarkmentStatus (list2, Vessel2)</b>
Second rotation: Vessel 2 embark units	<b>Provider send:</b> <b>NETN_ConvoyEmbarkmentStatus (list3, Vessel2)</b>
During transport, service Provider received MunitionDetonation Vessel 2 is destroyed	<b>Provider send:</b> <b>NETN_ConvoyDestroyedEntities (list3)</b>
End of service or Cancel	

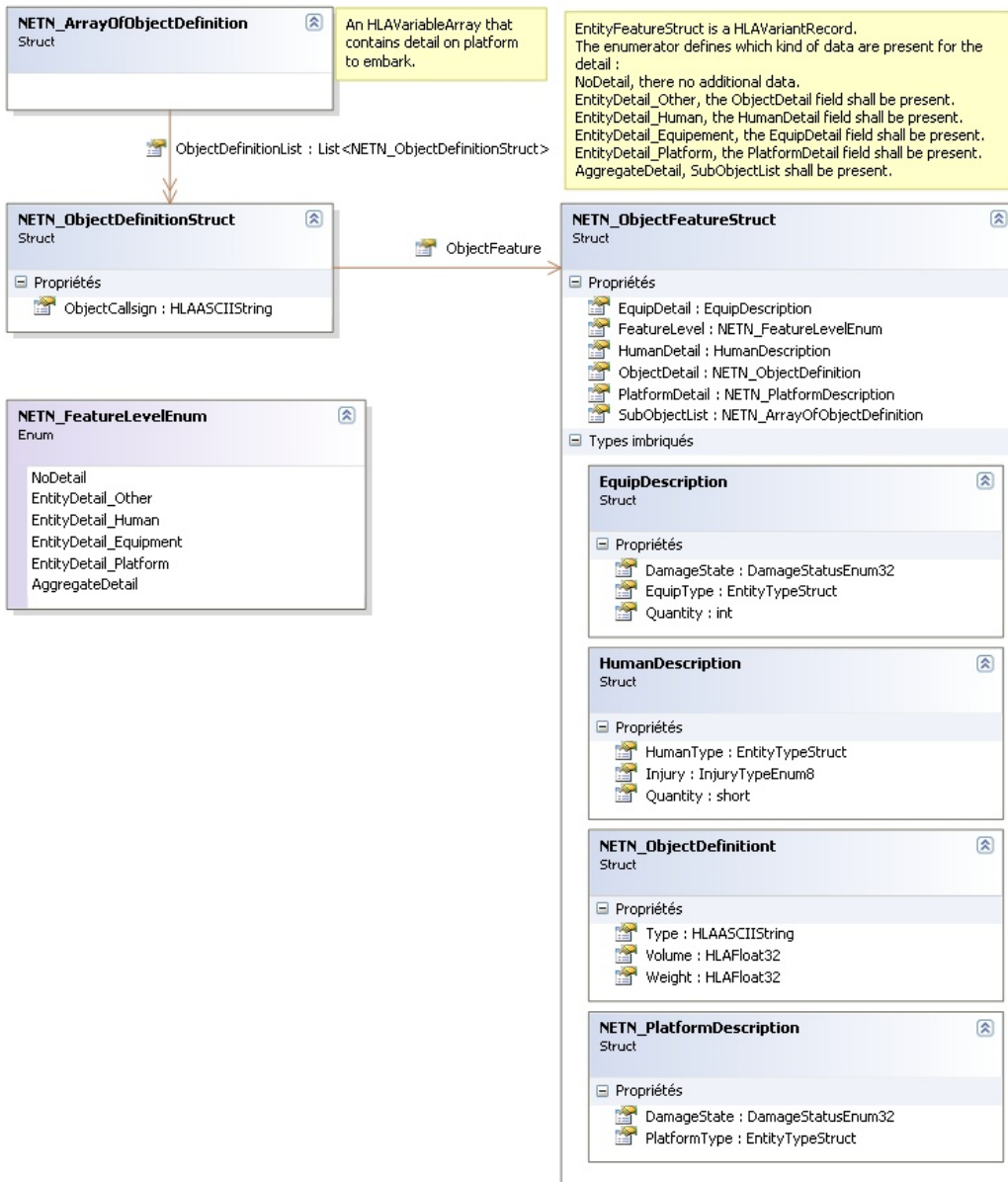
We notice that a **NETN\_ConvoyEmbarkmentStatus** interaction does not necessarily fit a **NETN\_ConvoyDisembarkmentStatus** interaction.

### 8.6.5 Convoy datatypes

To be able to manage different levels of granularity between simulators, a definition of the object to convoy is encapsulated in a temporary structure.

To make a Convoy, federate shall build a list of elements and exchange it to negotiate the service.

The figure below shows the content of such a list and how elements for Convoy service are defined towards **NETN\_ArrayOfObjectDefinition**.



Interactions use **NETN\_AppointmentStruct** to define date, time and location of desired Convoy service. Both Consumer and Provider must agree on these data to accept the service.



### 8.6.6 Scenario preparation phase

A scenario preparation phase entails to share information (online or offline) between simulations. Therefore, a strategy is needed before running an experimentation to share data (scenario, units types (EntityType), callsign, etc.).

Concerning Disembarkment service, a scenario can start to run with already embarked units. The embarkment phase is supposed to have taken place during the scenario preparation phase, so simulations do not have to play it using interactions.

To allow simulations to play such cases, we propose the following solution:

- For Embarkment, in preparation phase of a simulation, the EmbeddedUnitList allows to describe on board elements. This list contains items (like callsigns) provided by simulations that want to see them embarked at scenario start.
- The synchronization process for two simulations in a scenario preparation phase (offline) is the following:
  - Simulation A (Consumer) provides information (offline) to simulation B (Provider) on elements that must be on board at the beginning of scenario execution (Callsigns, scenario elements),
  - Simulation B initializes its scenario with these elements,
  - During scenario execution, Simulation B publishes information on embarked elements using « EmbeddedUnitList »,
  - During the first HLA objects discover, Simulation A analyzes « EmbeddedUnitList » attributes, looking for its own potentially embarked elements,
  - Simulation A updates its embarked elements (inactivation),
  - Simulations A & B use interactions as defined in Disembarkment protocol.
- This procedure allows limiting synchronization and data capture errors between simulations during preparation phase.

### 8.6.7 Convoy Pattern Exception

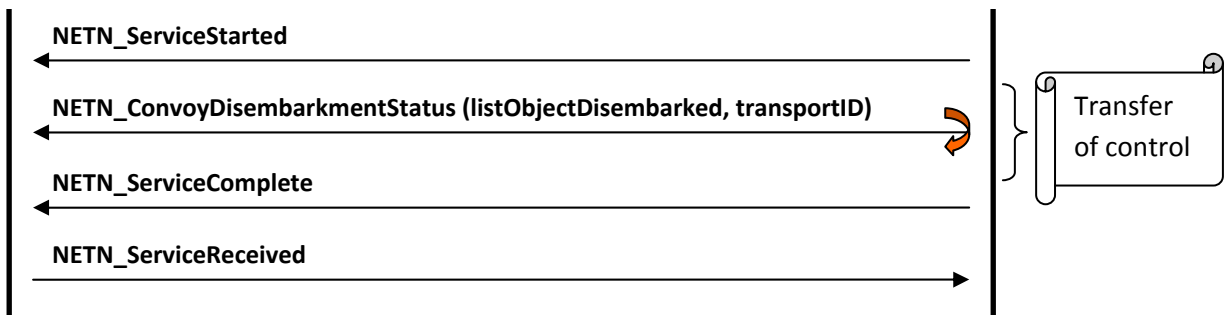
Two ways are possible in order to disembark units:

- A service Provider waits for a request service for disembarkment of embarked units (see standard Disembarkment protocol).
- A service Provider sends directly a NETN\_ServiceStarted to the Consumer (see schema below).

This second way bypasses the regular negotiation phase (see standard Disembarkment protocol). It could be employed to disembark already embarked units at scenario beginning.

**Consumer**

**Provider**



## 8.7 RPR-FOM Platform Objects Class Extensions

Platforms are a central element in the Logistics FOM through which units can be transported. In the Logistics FOM Module the RPR-FOM platform object classes are subclasses to add additional information used in the Logistics pattern described in this document.

We chose to add attributes to «RPR Platform object» children to define Current state of Embarked elements on transporter platforms. Indeed, interactions have a limited lifetime and do not allow to update a state at any time on the HLA federation.

**EmbeddedUnitList** provides the list of elements carried by a transporter. Listed items are composed of « Callsigns » of on-board units (aggregates or platforms). The list is updated by the transporter according to carried elements.

## 8.8 Facility object class

Facilities are a central element in the Logistics FOM through which material can be transferred.

Facilities could be created during a simulation or be a part of the infrastructure (railway station, storage tanks depot, port, etc.). A facility could also be part of a unit (ship, etc.).

The RPR-FOM v2.0 BaseEntity object class is extended with a subclass **NETN\_Facility**, with the following attributes (inherited parameters are written in italics):

Full Name		HLAObjectRoot.BaseEntity.NETN_Facility		
Attribute Name	Datatype	Default Value	Definition	Usage
<i>EntityIdentifier</i>	<i>EntityIdentifierStruct</i>	<i>Not Optional</i>	<i>Identifies the site, application, and entity number of this object instance. It is used for group addressing in the SIMAN interactions.</i>	<i>Required</i>
<i>EntityType</i>	<i>EntityTypeStruct</i>	<i>Not Optional</i>	<i>Kind, Country, Domain, Category, Subcategory, Specific, and Extra fields of the DIS Entity Type.</i>	<i>Required</i>
<i>IsPartOf</i>	<i>IsPartOfStruct</i>	<i>All zeros</i>	<i>Used to indicate that there is a spatial relationship between this entity and a host entity, i.e., one entity is "part of" another</i>	<i>Optional for NETN_Facility</i>
<i>RelativeSpatial</i>	<i>SpatialStruct</i>	<i>All zeros</i>	<i>Used to express the spatial relationship between the entity and a host entity. Used in addition to the normal spatial attribute which describes absolute location.</i>	<i>Optional for NETN_Facility</i>
<i>Spatial</i>	<i>SpatialStruct</i>	<i>Not Optional</i>	<i>Used to express the spatial relationship between the entity and the center of the Earth.</i>	<i>Required</i>
DamageState	DamageStatusEnum3 2	No Damage	Damage State of Facility	Required for NETN_Facility



Attribute Name	Datatype	Default Value	Definition	Usage
ForceIdentifier	ForceIdentifierEnum8	Other	Enumeration distinguishing the different teams or sides in an exercise.	Required for NETN_Facility
Callsign	NETN_Callsign	Not Optional	Callsign of the facility.	Required
UniqueID	NETN_UniqueID		Unique id of the facility instance.	
IsOperational	HLAboolean	HLAtrue	True if the facility is operational and can provide service	
StorageList	SupplyArray	Not Optional	List of Materials (Amount, Type) stored in the facility (no platforms). Material loaded on means or on resources of transport which are located in the facility are also included. Material belonging to an object of the object list is excluded.	Required
PlatformList	UniqueIDArrayStruct	Not Optional	List of non-active platforms/units in the facility. Includes those platforms transferred to the facility with a ServiceRequest (Type = Deposit) or located by the provider-model in the facility.	Required

The specific type of facility (Service Type) is defined as part of the EntityType attribute. The following enumeration scheme is to be used for the following service types.

Type of Facility	Kind.Dom.Cou.Cat.Sub.Spec.Ex (EntityType)
Storage (Material)	TBD
Maintenance	TBD
Medical	TBD
FARP	TBD
TBD Base	TBD
NBC	TBD
Camp	TBD

Enumerations to be defined in federation specific agreements

## 8.9 Interaction Classes

The NETN Logistics FOM module can be used to represent services for Supply, Storage, Repair, Transport, Embarkment and Disembarkment.

The basic pattern used by all NETN services is the Service Consumer-Provider Pattern which defines negotiation and delivery of services.

Logistics services use interactions from this Service Consumer-Provider Pattern and extend them (if needed) to support specific types of logistic services.

The following Logistics interactions class extensions to the Service Consumer-Provider pattern are used in the NETN Logistics FOM Module:

Class 1	Class 2	Class 3
NETN_Service	NETN_RequestService	NETN_RequestSupply
		NETN_RequestStorage
		NETN_RequestRepair
		NETN_RequestConvoy
	NETN_OfferService	NETN_OfferSupply
		NETN_OfferRepair
		NETN_OfferStorage
		NETN_OfferConvoy
	NETN_AcceptOffer	
	NETN_RejectOffer	NETN_RejectOfferConvoy
	NETN_ReadyToReceiveService	NETN_ReadyToReceiveSupply
	NETN_ServiceStarted	NETN_StorageStarted
	NETN_ServiceComplete	NETN_SupplyComplete
	NETN_ServiceReceived	
NETN_CancelService	NETN_CancelConvoy	
	NETN_ConvoyEmbarkmentStatus	
	NETN_ConvoyDisembarkmentStatus	
	NETN_ConvoyDestroyedEntities	

### 8.9.1 NETN\_RequestConvoy

A request for Transport, Embarkment or Disembarkment of a platform is initiated by a **NETN\_RequestConvoy** interaction with the following parameters (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_RequestService.NETN_RequestConvoy		
Parameter Name	Datatype	Default Value (if optional)	Definition
ServiceID	NETN_EventIdentifier	Not optional	Unique identifier for a service
Consumer	NETN_Callsign	Not optional	Entity that has requested the service
Provider	NETN_Callsign	Not optional	Providing or intended provider entity
ServiceType	ServiceTypeEnum8	Not optional	Type of requested service. Convoy = 3
RequestTimeOut	HLAinteger64BE	Optional	Defined a deadline (date) for the provider response. Number of second since 01/01/1970
TransportData	NETN_TransportStruct	Elements to convoy	Defined the type of service which will be done; transport, embarkment or disembarkment. The elements and

Parameter Name	Datatype	Default Value (if optional)	Definition
			constraint defined is function of the service to achieve

### 8.9.2 NETN\_OfferConvoy

A **NETN\_OfferConvoy** interaction shall be sent by the service providing federate in response to a **NETN\_RequestConvoy** interaction (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_OfferService.NETN_OfferConvoy		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Convoy = 3</i>
<i>IsOffering</i>	<i>HLAboolean</i>	<i>Not Optional</i>	<i>Defines if the requested service is offered (=true) or not (=false)</i>
<i>RequestTimeOut</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Defined a deadline (date) for the provider response. Number of second since 01/01/1970</i>
OfferType	NETN_OfferTypeEnum32	Not Optional	Provide high level information about the acceptance of the request (Partial, Full) without need to compare information from the initial request and the offer.
TransportData	NETN_TransportStruct	Elements to convoy offered if <i>isOffering = true</i> Could be contained less elements than the request	Defined the service which will be done for transport, embarkment or disembarkment.
ListOfTransporters	NETN_ArrayOfObjectDefinition	Optional (Default: empty list)	Informative - Platform list of transporters keep for the service (Callsign)

If needed, the TransportData parameter is allowed to be different from the corresponding information in the NETN\_RequestConvoy depending on the constraint of service request. The list of elements offered by the service provider can therefore be either complete or partial (subset) of the elements requested. Constraints (time and location) can also be different from the request. If a Provider agrees with a TransportData request, it repeats the data provided by the Consumer without modification.

### 8.9.3 NETN\_CancelConvoy

A **NETN\_CancelConvoy** interaction shall be sent by the service providing or the service Consumer federate to cancel the service transaction (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_CancelService.NETN_CancelConvoy		
Parameter Name	Datatype	Default Value (if optional)	Definition

Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Convoy = 3</i>
Reason	HLAASCIIstring	Optional (Default: empty String)	Allows to inform about the reason of the cancel (free text)

### 8.9.4 NETN\_RejectOfferConvoy

A **NETN\_RejectOfferConvoy** interaction shall be sent by a service Consumer federate to refuse a **NETN\_OfferConvoy** interaction (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_RejectOffer.NETN_RejectOfferConvoy		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Convoy = 3</i>
Reason	HLAASCIIstring	Optional (Default: empty String)	Allows to inform about the reason of the reject (free text)

### 8.9.5 NETN\_ConvoyEmbarkmentStatus

A **NETN\_ConvoyEmbarkmentStatus** interaction shall be sent by a service Provider federate to inform a service Consumer of the embarkment state, after a **NETN\_ServiceStarted** interaction (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_ConvoyEmbarkmentStatus		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Convoy = 3</i>
ListOfObjectEmbarked	NETN_ArrayOfObject Definition	List of element embarked by the provider	Allows to follow the elements managed by the provider
TransportUnitIdentifier	NETN_Callsign	Identifier of transporter	Callsign of transporter

### 8.9.6 NETN\_ConvoyDisembarkmentStatus

A **NETN\_ConvoyDisembarkmentStatus** interaction shall be sent by a service Provider federate to inform a service Consumer of the disembarkment state, after a **NETN\_ServiceStarted** interaction (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_ConvoyDisembarkmentStatus
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Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Convoy = 3</i>
ListObjectDisembarked	NETN_ArrayOfObject Definition	List of element disembarked by the provider	Allows to follow the elements managed by the provider
TransportUnitIdentifier	NETN_Callsign	Identifier of transporter	Callsign of transporter

### 8.9.7 NETN\_ConvoyDestroyedEntities

A **NETN\_ConvoyDestroyedEntities** interaction is used by a service Provider federate to give information to the Consumer on managed elements. This interaction is only used if the Provider simulates destruction of managed elements (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_ConvoyDestroyedEntities		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Convoy = 3</i>
ListOfEmbarkedObjectDestroyed	NETN_ArrayOfObject Definition	List of element destroyed during the convoy	Allows to follow the elements managed by the provider

### 8.9.8 NETN\_RequestSupply

A request for supply is initiated by a **NETN\_RequestSupply** interaction with the following parameters (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_RequestService.NETN_RequestSupply		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Supply = 1</i>
<i>RequestTimeOut</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Specifies an absolute deadline (date/time) for the provider response. Number of second since 01/01/1970</i>
SuppliesData	SupplyArray		List of type and quantity of supplies requested.
LoadingDoneByPro	HLABoolean	Optional	Determines whether the service

Parameter Name	Datatype	Default Value (if optional)	Definition
vider		(Default = true)	provider (LoadingDoneByProvider = true) or the service consumer (LoadingDoneByProvider = false) takes care of the (un)loading of the material

Note that if the time specified in the RequestTimeout passes without the Provider sending an NETN\_OfferSupply, then the Consumer will send a NETN\_CancelService.

Note that a Consumer can ask Supply to multiple Providers by leaving the Provider Callsign empty.

### 8.9.9 NETN\_OfferSupply

In response to a **NETN\_RequestSupply** interaction, a federate simulating the service providing entity shall send a **NETN\_OfferSupply** interaction, with following content (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_OfferService.NETN_OfferSupply		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Supply = 1</i>
<i>IsOffering</i>	<i>HLAboolean</i>	<i>(Not Optional)</i>	<i>Defines if the requested service is offered (=true) or not (=false)</i>
<i>RequestTimeout</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Specifies an absolute deadline (date/time) for the provider response. Number of second since 01/01/1970</i>
SuppliesData	SupplyArray	All offered supplies if isOffering = true otherwise Undefined	List of type and quantity of supplies offered. May be different from the list of requested supplies.
LoadingDoneByProvider	HLABoolean	Optional (Default = true)	Determines whether the service provider (LoadingDoneByProvider = true) or the service consumer (LoadingDoneByProvider = false) takes care of the (un)loading of the material

The following agreements pertain to the NETN\_OfferSupply interaction:

- The NETN\_OfferSupply.SuppliesData must include an amount less than or equal to the requested amount.
- The provider will reserve the offered amount of the supplies when the NETN\_OfferSupply is sent and not "un-reserve" them unless the consumer sends a NETN\_RejectOffer or either federate sends a NETN\_CancelService.
- If the resupply involves an aerial refuelling, and if the Provider sends a LoadingDoneByProvider = false value, the (provider) tanker aircraft must stay in its existing orbit until either the refuelling is complete or the consumer sends a NETN\_RejectOffer or either federate sends a NETN\_CancelService

### 8.9.10 NETN\_AcceptOffer/NETN\_RejectOffer

In response to a timely (i.e. one sent prior to the RequestTimeOut date/time) **NETN\_OfferSupply** interaction, a federate simulating the service consumer entity shall respond in one of three ways:

- If the provider responds with the NETN\_OfferService parameter *IsOffering* = "false, and if the request was not a multicast request, " the pattern terminates and the consumer must seek a new provider.
- If the values in *SuppliesData* and *LoadingDoneByProvider* are acceptable, the consumer will respond with a **NETN\_AcceptOffer**.
- If the values in *SuppliesData* or the *LoadingDoneByProvider* are unacceptable, the consumer will respond with a **NETN\_RejectOffer**.

### 8.9.11 NETN\_ReadyToReceiveSupply

Subsequent to sending a **NETN\_AcceptOffer**, the consumer will, when ready to receive transfer of supplies, initiate a **NETN\_ReadyToReceiveSupply** interaction.

Full Name			
HLAinteractionRoot.NETN_Service.NETN_ReadyToReceiveService.NETN_ReadyToReceiveSupply			
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Supply = 1</i>
<i>IsOffering</i>	<i>HLAboolean</i>	<i>(Not Optional)</i>	<i>Defines if the requested service is offered (=true) or not (=false)</i>
<i>RequestTimeOut</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Specifies an absolute deadline (date/time) for the provider response. Number of second since 01/01/1970</i>
<i>SuppliesData</i>	<i>SupplyArray</i>		List of type and quantity of supplies desired. May be smaller or less than the list of requested supplies.

Note that the number(s) or amount(s) of supplies specified by the consumer in **NETN\_ReadyToReceiveSupply.SuppliesData** must be less than or equal to the **NETN\_OfferSupply** number(s) or amount(s).

### 8.9.12 NETN\_SupplyComplete

Subsequent to sending a **NETN\_ServiceStarted** interaction, and when a federate simulating the service providing entity has finished transferring the agreed upon material, the provider shall send a **NETN\_SupplyComplete** interaction, with following content (inherited parameters written in italics):

Full Name			
HLAinteractionRoot.NETN_Service.NETN_ServiceComplete.NETN_SupplyComplete			
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Supply = 1</i>
<i>SuppliesData</i>	<i>SupplyArray</i>	<i>Not optional</i>	List of type and quantity of supplies actually transferred.

One of two events may occur to cause the amount or quantity of supplies actually delivered to be less or fewer than the amount of supplies specified in the **NETN\_ReadyToReceiveSupply.SuppliesData**:

1. The Provider object may die or be destroyed. If this occurs, the federate simulating the provider object will initiate the NETN\_SupplyComplete interaction with the SuppliesData comprised of supplies transferred prior to the loss of the Provider object.
2. If the Consumer object dies or is destroyed, the federate simulating the consumer object will initiate a NETN\_CancelService, thereby terminating the transfer of supplies. Note that either federate may also send a NETN\_CancelService for reasons unrelated to the loss of a consumer or provider object. Regardless of the reason, if a NETN\_CancelService is sent, the provider will initiate the NETN\_SupplyComplete interaction with the SuppliesData comprised of supplies transferred prior to the NETN\_CancelService.

### 8.9.13 NETN\_RequestStorage

A request for storing supplies is initiated by a **NETN\_RequestStorage** interaction with the following parameters (inherited parameters written in italics):

Full Name			
HLAinteractionRoot.NETN_Service.NETN_RequestService.NETN_RequestStorage			
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Storage = 4</i>
<i>RequestTimeOut</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Defined a deadline (date) for the provider response. Number of second since 01/01/1970</i>
SuppliesData	SupplyArray	Not optional	List of type and quantity of supplies requested to be stored.
LoadingDoneByProvider	HLABoolean	Optional (Default = true)	Determines whether the service provider (LoadingDoneByProvider = true) or the service consumer (LoadingDoneByProvider = false) takes care of the (un)loading of the material

### 8.9.14 NETN\_OfferStorage

In response to a NETN\_RequestStorage interaction, a service providing federate shall send a NETN\_OfferStorage interaction, with following content (inherited parameters written in italics):

Full Name			
HLAinteractionRoot.NETN_Service.NETN_OfferService.NETN_OfferStorage			
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Storage = 4</i>
<i>IsOffering</i>	<i>HLAboolean</i>	<i>(Not Optional)</i>	<i>Defines if the requested service is offered (=true) or not (=false)</i>
<i>RequestTimeOut</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Defined a deadline (date) for the provider response. Number of second</i>



Parameter Name	Datatype	Default Value (if optional)	Definition
			<i>since 01/01/1970</i>
SuppliesData	SupplyArray	All supplies offered to be stored if isOffering = true otherwise Undefined	List of type and quantity of supplies offered to be stored. May be different from the list of supplies requested to be stored.
LoadingDoneByProvider	HLABoolean	Optional (Default = true)	Determines whether the service provider (LoadingDoneByProvider = true) or the service consumer (LoadingDoneByProvider = false) takes care of the (un)loading of the material

### 8.9.15 NETN\_StorageStarted

In response to a **NETN\_OfferReceived** interaction, a federate simulating the service providing entity shall send a **NETN\_StorageStarted** interaction, with following content (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_ServiceStarted.NETN_StorageStarted		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Storage = 4</i>
SuppliesData	SupplyArray	Not optional	List of type and quantity of supplies to be transferred. May be different from the list of supplies offered to be stored.

### 8.9.16 NETN\_RequestRepair

The request for repair of a platform is initiated by a **NETN\_RequestRepair** interaction with the following parameters (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_RequestService.NETN_RequestRepair		
Parameter Name	Datatype	Default Value (if optional)	Definition
<i>ServiceID</i>	<i>NETN_EventIdentifier</i>	<i>Not optional</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_Callsign</i>	<i>Not optional</i>	<i>Providing or intended provider entity</i>
<i>ServiceType</i>	<i>ServiceTypeEnum8</i>	<i>Not optional</i>	<i>Type of requested service. Repair = 2</i>
<i>RequestTimeOut</i>	<i>HLAinteger64BE</i>	<i>Optional</i>	<i>Defined a deadline (date) for the provider response. Number of second since 01/01/1970</i>
RepairData	RepairList	Not optional	List of all requested repairs.

### 8.9.17 NETN\_OfferRepair

In response to a **NETN\_RequestRepair** interaction, a federate simulating the service providing entity shall send a **NETN\_OfferRepair** interaction, with following content (inherited parameters written in italics):

Full Name	HLAinteractionRoot.NETN_Service.NETN_OfferService.NETN_OfferRepair		
Parameter Name	Datatype	Default Value (if optional)	Definition
ServiceID	NETN_EventIdentifier	Not optional	Unique identifier for a service
Consumer	NETN_Callsign	Not optional	Entity that has requested the service
Provider	NETN_Callsign	Not optional	Providing or intended provider entity
ServiceType	ServiceTypeEnum8	Not optional	Type of requested service. Repair = 2
IsOffering	HLAboolean	(Not Optional)	Defines if the requested service is offered (=true) or not (=false)
RequestTimeOut	HLAinteger64BE	Optional	Defined a deadline (date) for the provider response. Number of second since 01/01/1970
RepairData	RepairList	List of all offered repairs if isOffering = true otherwise Undefined	List of the type of repairs offered. May be different from the list of requested repairs.

## 8.10 Fixed Record Datatypes

### 8.10.1 NETN\_ObjectDefinitionStruct

Name	NETN_ObjectDefinitionStruct
Encoding	HLAfixedRecord
Definition	

Parameter Name	Datatype	Default Value	Definition
ObjectCallsign	NETN_Callsign	No	Callsign of the object (entity or aggregate) to embark
ObjectUniqueID	NETN_UniqueID	Optional	Optional ID usable to reference a published entity. This attributes must be specified if an HLA instance exist.
ObjectFeature	NETN_ObjectFeatureStruct	No	Detail of the object to embark

### 8.10.2 NETN\_ObjectDescription

Name	NETN_ObjectDescription
Encoding	HLAfixedRecord
Definition	

Parameter Name	Datatype	Default Value	Definition
Type	HLAASCIIString	"Unknown"	
Weight	NETN_Float32BE	No	Weight of object to embark (in kg).
Volume	NETN_Float32BE	No	Volume of object to embark (in m3)

### 8.10.3 NETN\_HumanDescription

Name	NETN_HumanDescription
Encoding	HLAfixedRecord
Definition	

Parameter Name	Datatype	Default Value	Definition
HumanType	EntityTypeStruct		The type of human defined by federate requesting the service
Quantity	NETN_Integer16BE		The number of person of the human

			type.
Injury	InjuryTypeEnum8		Degree of injury

#### 8.10.4 NETN\_EquipDescription

Name	NETN_EquipDescription		
Encoding	HLAfixedRecord		
Definition			
Parameter Name	Datatype	Default Value	Definition
EquipType	EntityTypeStruct		The type of equipment
Quantity	NETN_Integer32BE		The number of units of the Equip type.
DamageState	DamageStatusEnum32		Degree of damage

#### 8.10.5 NETN\_PlatformDescription

Name	NETN_PlatformDescription		
Encoding	HLAfixedRecord		
Definition			
Parameter Name	Datatype	Default Value	Definition
PlatformType	EntityTypeStruct		The type of equipment
DamageState	DamageStatusEnum32		Degree of damage

#### 8.10.6 NETN\_DataTStruct

Name	NETN_DataTStruct		
Encoding	HLAfixedRecord		
Definition			
Parameter Name	Datatype	Default Value	Definition
ObjectToManaged	NETN_ArrayOfObjectDefinition		
Appointment	NETN_AppointmentStruct		
FinalAppointment	NETN_AppointmentStruct		

#### 8.10.7 NETN\_DataEDStruct

Name	NETN_DataEDStruct		
Encoding	HLAfixedRecord		
Definition			
Parameter Name	Datatype	Default Value	Definition
ObjectToManaged	NETN_ArrayOfObjectDefinition		
Appointment	NETN_AppointmentStruct		

#### 8.10.8 NETN\_AppointmentStruct

Name	NETN_AppointmentStruct		
Encoding	HLAfixedRecord		
Definition			
Parameter Name	Datatype	Default Value	Definition

Parameter Name	Datatype	Default Value	Definition
DateTime	HLAinteger64BE	No	Number of second since 1 january1970
Location	WorldLocationStruct	No	Location

### 8.10.9 RepairStruct

Name	RepairStruct		
Encoding	HLAfixedRecord		
Definition	Repairs associated with a specific material		
Parameter Name	Datatype	Default Value	Definition
MaterialID	NETN_UniqueID		HLA object id for the material.
Repairs	RepairTypeList		List of the types of repair associated with the material.

### 8.10.10 SupplyStruct

Name	<i>SupplyStruct</i>		
Encoding	HLAfixedRecord		
Definition			
Parameter Name	Datatype	Default Value	Definition
<i>SupplyType</i>	EntityTypeStruct		The type of supply
<i>Quantity</i>	NETN_Float32BE		The number of units of the supply type. The unit measure depends on the supply type and shall use the SI units of measurement used for such supplies.

### 8.11 Array Datatypes

Name	Datatype	Cardinality	Encoding	Definition
RepairList	RepairStruct	Dynamic	HLAvariableArray	List of repair descriptions (equipment and type of repairs).
RepairTypeList	RepairTypeEnum16	Dynamic	HLAvariableArray	List of repair types.
SupplyArray	SupplyStruct	Dynamic	HLAvariableArray	
NETN_ArrayOfObjectDefinition	NETN_ObjectDefinitionStruct	Dynamic	HLAvariableArray	

### 8.12 Enumerated Datatypes

#### 8.12.1 ServiceTypeEnum8 datatype

Name	ServiceTypeEnum8	
Representation	HLAoctet	
Definition	-	
Enumerate	Value	Definition
Other	0	
Resupply	1	
Repair	2	
Storage	3	
Convoy	4	

### 8.12.2 NETN\_ConvoyTypeEnum32

Name	NETN_ConvoyTypeEnum32	
Representation	HLAinteger32Be	
Definition	-	
Enumerate	value	Definition
Transport	0	For a transport service
Embarkment	1	For a Embarkment service
Disembarkment	2	For a Disembarkment service

### 8.12.3 NETN\_OfferTypeEnum32

Name	NETN_OfferTypeEnum32	
Representation	HLAinteger32BE	
Definition	-	
Enumerate	Value	Definition
RequestAcknowledgeWithRestriction	0	Partially Compliant in accordance of the request
RequestAcknowledgePositive	1	Full compliant
RequestAcknowledgeNegative	2	Not compliant

### 8.12.4 NETN\_FeatureLevelEnum32

Name	NETN_FeatureLevelEnum32	
Representation	HLAinteger32BE	
Definition	-	
Enumerate	value	Definition
NoDetail	0	
EntityDetail_Other	1	
EntityDetail_Human	2	
EntityDetail_Equipment	3	
EntityDetail_Platform	4	
AggregateDetail	5	

## 8.13 Variant Record Datatypes

### 8.13.1 NETN\_TransportStruct

Name	NETN_TransportStruct			
Discriminant Name	ConvoyType			
Discriminant Type	NETN_ConvoyTypeEnum32			
Encoding	HLAvariantRecord			
Definition				
Discriminant Enum	Parameter	Datatype	Default Value	Definition
Transport	dataTransport	NETN_DataTStruct		Present only if ConvoyType = Transport
Embarkment	dataEmbarkment	NETN_DataEDStruct		Present only if ConvoyType = Embarkment
Disembarkment	dataDebarkment	NETN_DataEDStruct		Present only if ConvoyType = Disembarkment

### 8.13.2 NETN\_ObjectFeatureStruct

Name	NETN_ObjectFeatureStruct
Discriminant Name	FeatureLevel
Discriminant Type	NETN_FeatureLevelEnum32
Encoding	HLAvariantRecord
Definition	

Discriminant Enum	Parameter	Datatype	Default Value	Definition
AggregateDetail	SubObjectList	NETN_ArrayOfObjectDefinition	No	Present only if FeatureDescriptionLevel equals "AggregateDetail"
EntityDetail_Other	ObjectDetail	NETN_ObjectDescription	No	Present only if FeatureDescriptionLevel equals "EntityDetail_Other"
EntityDetail_Human	HumanDetail	NETN_HumanDescription	No	Present only if FeatureDescriptionLevel equals "EntityDetail_Human"
EntityDetail_Equipment	EquipDetail	NETN_EquipDescription	No	Present only if FeatureDescriptionLevel equals "EntityDetail_Equipment"
EntityDetail_Platform	PlatformDetail	NETN_PlatformDescription	No	Present only if FeatureDescriptionLevel equals "EntityDetail_Platform"

# 9 NETN Aggregate Unit FOM Module v1.0

## 9.1 Introduction

The NETN Aggregated Unit Representation FOM Module documents extensions to the RPR-FOM v2.0 D17 FOM Module necessary for representation and use of aggregate units in the NETN. The chapter starts by documenting NETN Object Classes as extensions to RPR-FOM v2.0 classes and federation agreements regarding the use of the object classes.

It then discusses methods of adjudicating combat between objects owned by different federates and concludes by identifying necessary extensions to interactions.

## 9.2 NETN Aggregated Unit Object Classes

### 9.2.1 NETN\_Aggregate

The NETN\_Aggregate object class is a subclass of the RPR FOM class BaseEntity.AggregateEntity. The table below describes the attributes, data types, and semantics for the NETN\_Aggregate class. Inherited attributes are shown in italics.

Attribute (Optional)	Datatype	Default Value (If optional)	Definition	Usage
<i>EntityIdentifier</i>	<i>EntityIdentifierStruct</i>	<i>(Not Optional)</i>	Identifies the site, application, and entity number of this object instance. It is used for group addressing in the SIMAN interactions.	Required
<i>EntityType</i>	<i>EntityTypeStruct</i>	<i>(Not Optional)</i>	<i>Kind, Country, Domain, Category, Subcategory, Specific, and Extra fields of the DIS Entity Type.</i>	Required
<i>IsPartOf</i>	<i>IsPartOfStruct</i>	<i>All zeros</i>	Used to indicate that there is a spatial relationship between this entity and a host entity, i.e., one entity is "part of" another	
<i>RelativeSpatial</i>	<i>SpatialStruct</i>	<i>All zeros</i>	Used to express the spatial relationship between the entity and a host entity. Used in addition to the normal spatial attribute which describes absolute location.	
<i>Spatial</i>	<i>SpatialStruct</i>	<i>(Not Optional)</i>	Used to express the spatial relationship between the entity and the center of the Earth.	Required
<i>AggregateMarking</i>	<i>AggregateMarkingStruct</i>	<i>All zeros</i>	<i>A unique marking or combination of characters used to distinguish the aggregate from other aggregates.</i>	
<i>AggregateState</i>	<i>AggregateStateEnum8</i>	<i>(Not Optional)</i>	<i>An indicator of the extent of association of objects form an operating group.</i>	Required (see FA1)
<i>Dimensions</i>	<i>DimensionStruct</i>	<i>(Not Optional)</i>	<i>The size of the area covered by the units in the aggregate.</i>	Required
<i>EntityIdentifiers</i>	<i>RTIObjectIdArrayStruct</i>	<i>(Not Optional)</i>	<i>The identification of entities that are contained within the aggregate.</i>	Required (see FA2)
<i>ForceIdentifier</i>	<i>ForceIdentifierEnum8</i>	<i>(Not Optional)</i>	<i>The identification of the force</i>	Required

Attribute (Optional)	Datatype	Default Value (If optional)	Definition	Usage
			<i>that the aggregate belongs to.</i>	
<i>Formation</i>	<i>FormationEnum32</i>	<i>(Not Optional)</i>	<i>The category of positional arrangement of the entities within the aggregate.</i>	<i>Required (see FA2)</i>
<i>NumberOfSilentEntities</i>	<i>short</i>	<i>(Not Optional)</i>	<i>The number of elements in the SilentEntities list</i>	<i>Required (see FA3)</i>
<i>NumberOfVariableDatums</i>	<i>unsigned long</i>	<i>0</i>	<i>The number of records in the Variable Datum structure</i>	<i>Not currently used</i>
<i>SilentAggregates</i>	<i>SilentAggregateStruct</i>	<i>(Not Optional)</i>	<i>The numbers and types, of silent aggregates contained in the aggregate. Silent aggregates are sub-aggregates that are in the aggregate, but that are not separately represented in the virtual world.</i>	<i>Required (see FA2)</i>
<i>SilentEntities</i>	<i>SilentEntityStruct</i>	<i>(Not Optional)</i>	<i>The numbers and types, of silent entities in the aggregate. Silent entities are entities that are in the aggregate, but that are not separately represented in the virtual world.</i>	<i>Required (see FA2)</i>
<i>SubAggregateIdentifier</i>	<i>RTIObjectIdArrayStruct</i>	<i>(Not Optional)</i>	<i>The identifications of aggregates represented in the virtual world that are contained in the aggregate.</i>	<i>Required (see FA2)</i>
<i>VariableDatums</i>	<i>VariableDatumStruct</i>		<i>Extra data that describes the aggregate.</i>	<i>Not currently used</i>
<i>Activity</i>	<i>AggregateMissionEnum</i>	<i>(Not Optional)</i>	The current activity of the aggregate. This may differ from the mission due to casualties, readiness, etc.	Required
<i>Callsign</i>	<i>HLAunicodeString</i>	<i>(Not Optional)</i>	The name of the object.	Required
<i>CaptureStatus</i>	<i>CaptureStatusEnum8</i>	<i>0</i>	The status of an aggregate with respect to its control or influence over its own activities.	
<i>CombatValue</i>	<i>NETN_Float64BE</i>	<i>100</i>	A summary value (in percent) of unit effectiveness based on level of training, leadership, moral, personnel and equipment operational status, etc.	
<i>CoverStatus</i>	<i>CoverStatusStruct</i>	<i>0</i>	Describes the unit's protection from the effects of weapons fire.	
<i>Echelon</i>	<i>EchelonEnum8</i>	<i>(Not Optional)</i>	The level of command of the aggregate	Required
<i>ElectronicSignature</i>	<i>ElectronicSignatureStruct</i>		Describes the aggregate's susceptibility to electronic detection both as a summary value and by identifying aggregate sensors together with	



Attribute (Optional)	Datatype	Default Value (If optional)	Definition	Usage
			their operational status	
EmbeddedUnitList	ArrayOfEmbeddedUnit		The list of objects carried by this aggregate.	
EntityList	EntityListVariableLength	(Not Optional)	Provides data on one or more entities comprising the aggregate. This includes the initial list of all entities and subsequent updates as entities on the list experience change. This attribute is optional outside the entity Interest Area (IA), but mandatory inside the IA.	Required within IAs (see FA 2)
Footprint	WorldLocationStructArray3		The region occupied by the aggregate. The region is defined as that bounded by line segments connecting the listed world locations	
HigherHeadquarters	NETN_UniqueID	(Not Optional)	A pointer to the aggregate's superior unit or headquarters. The highest level unit or headquarters on each side will publish its own UniqueID as its HigherHeadquarters value.	Required
HUMINTSignature	HUMINTSignatureStruct		Describes the unit's susceptibility to human intelligence (HUMINT), i.e. "information collected and provided by human sources."	
Mission	MissionStruct	(Not Optional)	The operational task the aggregate has been ordered to perform, the time the mission was assigned, and the estimated completion time.	Required
Mounted	NETN_Float64BE	(Not Optional)	The percentage of aggregate personnel traveling on or in their organic transport.	Required
SourceUnit	HLAUnicodeString	0	Aggregate from which this aggregate was spawned.	
Status	ActiveStatusEnum8	1	An inactive object should not be shown on C4I systems and cannot move or interact with other objects.	
SupportUnit	SupportRelationshipStruct		Identifies unit(s) which support the aggregate logistically, or with a specified combat or combat support relationship, e.g. a Direct Support or General Support Artillery unit.	
Symbol	HLAUnicodeString	(Not Optional)	The APP6A code for the aggregate.	Required
UniqueID	NETN_UniqueID	(Not Optional)	The unique identifier of the object.	Required

Attribute (Optional)	Datatype	Default Value (If optional)	Definition	Usage
UnitEquipment	ResourceStatusArray	(Not Optional)	This summarizes the health status of the equipment comprising the aggregate.	Required
UnitPersonnel	ResourceStatusArray	(Not Optional)	This summarizes the health status of personnel comprising the aggregate.	Required
UnitSupplies	SupplyStructArray1	(Not Optional)	The type and quantities of supplies available (on hand) to the unit.	Required
VisualSignature	VisualSignatureStruct100		Describes the unit's susceptibility to electro-optical detection.	
WeaponsControlOrder	WeaponsControlOrderEnum8		Describes current Weapon Control Order Free, Tight, or Hold.	

## 9.2.2 Federation Agreements

1. A federate not capable of or not intending to update an attribute should not include it in its declaration set.
2. A federate may request ownership of un-owned attributes after another federate declares its objects.
3. A federate shall not update an attribute unless its value changes.
4. If a federation intends on utilizing this FAD and accompanying FOM to adjudicate combat, all attributes shown as required must be updated.
5. NETN will use "Interest Areas" (IAs) to identify areas in which entity level data must be provided. Outside of the IAs it is acceptable for aggregate units to be "fully" aggregated, i.e. AggregateStateEnum8 = 1, though (until experimentation proves otherwise) it is not necessary that they be "fully" aggregated.
6. NETN will use the EntityList attribute within IAs rather than the attributes: EntityIdentifier, SubAggregateIdentifier, NumberOfSilentEntities, SilentEntities, and SilentAggregates
7. This attribute is intended as a pointer to an array of network objects of relevance to the aggregate but the network object itself is at this point undefined.
8. We will use both WeaponFire and MunitionDetonation for all except mines and IEDs.
9. The UniqueID shall be used in the Marking field as well as in the attributes and parameters which require it.

The enumerated DataTypes used in NETN\_Aggregate are further defined as follows:

## 9.3 Enumerated Datatypes

### 9.3.1 ActiveStatusEnum8

Name	Value
Other	0
Active	1
Inactive	2

### 9.3.2 AggregateMissionEnum16

(from JC3IEDM action-event-category-code)

Name	Value
Abdication	1

Name	Value
Accident	2
AccidentAircraftGround	3
Accident_Mine	4
Accident_Traffic	5
Accident_Weapon	6
Accident_Workplace	7
Advancing	8
AerialEngagement	9
AerialShootDown	10
AirAssault	11
AirborneAssault	12
AircraftCrash	13
AircraftLanding	14
AircraftLaunchActivity	15
AircraftLoss	16
AirspaceViolation	17
AlertCancellation	18
Ambush	19
AmphibiousOperation	20
ArmsProduction	21
ArmsTrade	22
Arresting_Legal	23
ArrestingOrObstructing	24
Arson	25
ArtilleryFire	26
Assassination	27
Assembling	28
AssistingACriminal	29
AtmosphericPollution	30
Attack_Deliberate	31
Attack_Diversion	32
Attack_Electronic	33
Attack_Hasty	34
Attack_Main	35
Attack_NotOtherwiseSpecified	36
Attack_Supporting	37
AttemptedMurder	38
AttemptedRape	39
AttemptedRobbery	40
AttemptedSuicide	41
Avoiding	42
BellyLanding	43
Blocking	44
Bombing	45
Bombing_Accidental	46
Bombing_Deliberate	47

Name	Value
BoobyTrapDiscovery	48
BorderCrossing_Escorted	49
BorderCrossing_Forced	50
BorderCrossing_Illegal	51
BorderCrossing_Not-Planned	52
BorderCrossing_Planned	53
BorderCrossing_Surveilled	54
BorderIncursion	55
BorderRaid	56
Breaching	57
Build-Up	58
BurnedOutObject	59
Bypass	60
Canalise	61
Capture	62
CarrierLaunch	63
CarrierRecovery	64
CBRN-EVENT	65
CeremonyOrParade	66
CivilDemonstration_Illegal	67
CivilDemonstration_Legal	68
CivilDisobedience	69
CivilUnrest	70
CivilWar	71
Clearing_Air	72
Clearing_LandCombat	73
Clearing_Obstacle	74
Clearing_RadioNet	75
CodewordExecution	76
Collision_Mid-Air	77
Collision_Obstacle	78
CommunicationsActivation	79
CommunicationsDeactivation	80
CommunicationsDisruption	81
CommunicationsInterception	82
CommunicationsOutage	83
CommunicationsRestoration	84
ConductingConference	85
ConductingForwardPassageOfLines	86
ConductingMediaInterview	87
ConductingPreparatoryFire	88
ConductingRearwardPassageOfLines	89
ConductingRecreationalActivities	90
ConductingRoadService	91
ConductingSocialEvents	92
ConductingSportingEvents	93

Name	Value
Confiscation	94
ConsolidatingOfAPosition	95
Constructing	96
Containing	97
Cooperating	98
CounterAttack	99
CounterAttackByFire	100
Counter-BatteryFire	101
CoupDetat	102
Covering	103
CrimeAgainstHumanity	104
CriminalIncident	105
Crossing	106
Dazzle	107
Death_NaturalCauses	108
DeathOfChiefOfState	109
DeathOfSpiritualLeader	110
Deception	111
Deception_Electronic	112
Defeat	113
Defending	114
Deflecting	115
Delaying	116
Demolition	117
Demonstration	118
Denying	119
Deploying	120
Destroying	121
Disease	122
Disengaging	123
Disrupting	124
Distributing	125
Diversion	126
Drive-ByShooting	127
Drought	128
DrugConsumption_Illegal	129
DrugDistribution_Illegal	130
DrugManufacturing_Illegal	131
DrugOperation	132
DrugStorage	133
DrugTransportation	134
EarlyWarningAlert	135
Earthquake	136
ElectionAssociatedViolence	137
ElectronicEmission	138
ElectronicWarfare	139

Name	Value
EnemyContact	140
Engaging	141
Enveloping	142
Epidemic	143
EquipmentFailure	144
Escaping	145
Escorting	146
Evacuating	147
Execution	148
Exploitation	149
Explosion	150
Famine	151
Fire	152
Firefighting	153
Fix	154
Fix_Acoustic	155
Fix_Electromagnetic	156
Fix_Electro-Optical	157
Flood	158
FollowingAndAssuming	159
FollowingAndSupporting	160
ForcedLanding	161
FriendlyFire	162
GeneratingChemicalSmoke	163
Genocide	164
GovernmentalCollapse	165
Guarding	166
Gunnery_Air-To-Air	167
Harassing	168
Hiding	169
Hijacking_Boat	170
Hijacking_LandVehicle	171
Hijacking_NotOtherwiseSpecified	172
Hijacking_Plane	173
Hold_Defensive	174
Hold_Offensive	175
HostageTaking	176
HumanRightsViolation	177
Hunting	178
Identifying	179
Illumination	180
IndirectFire	181
IndiscriminateShooting	182
IndustrialEspionageIncident	183
Infiltration	184
Interception	185

Name	Value
Interdiction	186
Intimidation	187
Invasion	188
Isolation	189
IssuingMediaArticle	190
IssuingMediaDocumentary	191
IssuingPressRelease	192
Jamming	193
Kidnapping	194
LabourStrike	195
Leaguer	196
LetterBombExplosion	197
LetterBombIncident	198
LocalElection	199
Locating	200
Looting	201
Maintaining	202
Marking	203
MartialLawImplementation	204
MassingOfForces	205
MassiveDeportationOrBanishment	206
MedicalEvacuation	207
MilitaryMobilisation	208
Mine-Laying	209
MissingIndividual	210
MissionStaging	211
MortarFire	212
Moving	213
Murder	214
MutualAssistancePactAgreement	215
NationalElection	216
NationalHoliday	217
NationalStateOfEmergency	218
NaturalDisaster	219
NavalGunFire	220
NavalPlatformFlightOperations	221
NetworkSeizure	222
Neutralize_Chemical	223
Neutralize_Combat	224
Neutralize_Explosive	225
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### 9.3.3 CaptureStatus8

Name	Value
Other	0
Not-Captured	1
Captured	2
AttemptingSurrender	3
AttemptingEscape	4

### 9.3.4 ConcealmentEnum8

Name	Value
Invalid	0
InOpen	1
MountedInternally	2
MountedExternally	3
UnderNet	4
UnderGround	5
InsideStructure	6
FightingPositionCovered	7
FightingPositionUncovered	8

### 9.3.5 CoverEnum8

Name	Value
Other	0
HastyFightingPositions	1
IndividualFightingPositions	2
CrewServedWeaponsPositions	3
FightingPositionsWithOverheadCover	4
StrongPoints	5

### 9.3.6 DamageStatusEnhancedEnum32

Name	Value
NoDamage	0
SlightDamage	1
ModerateDamage	2
SignificantDamage	3
Destroyed	4

### 9.3.7 EchelonEnum8 (from JC3IEDM echelon-size-code)

Name	Value
Army	1
ArmyGroup	2
Battalion	3
BattalionGroup	4
BattleGroup	5
Brigade	6
BrigadeGroup	7
Company	8
CompanyGroup	9
Corps	10
Division	11
Fleet	12
Flight	13
Platoon	14
Regiment	15
Region	16
Section	17
Squad	18
SquadronAir	19
SquadronMaritime	20
TaskElementNavy	21
TaskForceNavy	22
TaskGroupNavy	23
TaskUnitNavy	24
TeamFireteamCrew	25
Wing	26
NotKnown	27
NotOtherwiseSpecified	28

### 9.3.8 EntityCategoryEnum8

Name	Value
Invalid	0
EquipmentEntity	1
PersonnelEntity	2
EmitterEntity	3
RadioEntity	4

### 9.3.9 SensorStateEnum8

Name	Value
Other	0
Off	1
OnButNotEmitting	2
OnAndEmitting	3

### 9.3.10 SupportRelationshipEnum8

Name	Value
Other	0
Logistics	1
DirectSupportArtillery	2
DirectSupportReinforcingArtillery	3
GeneralSupportArtillery	4
Engineering	5

### 9.3.11 UpdateTypeEnum8

Name	Value
Invalid	0
Create	1
Update	2
Addition	3
Delete	4

### 9.3.12 WeaponsControlOrderEnum8

Name	Value
Other	0
WeaponsFree	1
WeaponsTight	2
WeaponsHold	3

## 9.4 Complex Datatypes

### 9.4.1 CoverStatusStruct

Name	Type	Semantics
CoverStatusPercent	NETNPercentage	The percentage of protection enjoyed by an aggregate. A unit with 100 percent cover would be impervious to the effects of

Name	Type	Semantics
		weapons fire
CoverTypeEnum	CoverEnum8	An optional field describing the type of cover employed by the aggregate

### 9.4.2 ElectronicSignatureStruct

Name	Type	Semantics
ElectronicSignaturePercent	NETNPercentage	A summary percentage of an aggregates susceptibility to detection of its electronic emissions. Zero percent means that the aggregate has no electronic emissions.
SensorArray	SensorStructArray1	A list of sensors owned by the aggregate together with their respective operational status and range.

### 9.4.3 EntityListStruct

An array of elements of Datatype EntityStruct with cardinality 1+

### 9.4.4 EntityStruct

Name	Type	Semantics
Callsign	HLAunicodeString	The name of the object.
EntityCategory	EntityCategoryEnum32	Indicates whether the entity is equipment, person, emitter, etc.
EntityStatus	DamageStatusEnhancedEnum32	The damage state of the entity.
IsDistinctObject	OMT13boolean	OPTIONAL. A BaseEntity object has been created to represent this entity (true) or not (false).
IsUnavailable	OMT13boolean	OPTIONAL. This entity is in use by another object (true) or not (false).
Facing	Float15	OPTIONAL. Direction is measured in degrees clockwise from orientation of unit
Concealment	ConcealmentEnum32	OPTIONAL. Indicates whether the entity is concealed and, if so, how
OffsetLocation	RelativePositionStruct	The entity location given as an offset from the location of the aggregate unit in meters.

Note: Padding check needed after Callsign

### 9.4.5 EntityListVariableArrayStruct

Name	Type	Semantics
Update Type	UpdateTypeEnum32	Indicates whether this update creates the list or modifies its' values.
EntityList	EntityListStruct	Data about one or more entities comprising the list.

### 9.4.6 HUMINTSignatureStruct

Name	Type	Semantics
HUMINTSignaturePercent	NETNPercentage	A summary percentage of an aggregates susceptibility to detection by human intelligence collectors. Zero percent signature means an aggregate is impervious to HUMINT.

### 9.4.7 MissionStruct

Name	Type	Semantics
StartTime	DateTime	An optional field providing the mission start time

Name	Type	Semantics
EndTime	DateTime	An optional field providing the mission estimated end time
MissionEnum	AggregateMissionEnum16	The mission assigned to the aggregate

### 9.4.8 NetworkList

An array of elements of DataType HLAUnicodeString with cardinality 0+. Note: Padding check needed after each element (except final element).

### 9.4.9 ResourceStatusNumber

Name	Type	Semantics
NumberHealthyOrIntact	NETN_Float64BE	The number of healthy or intact resources
NumberSlightlyDamaged	NETN_Float64BE	The number of slightly damaged resources
NumberModeratelyDamaged	NETN_Float64BE	The number of moderately damaged resources
NumberSignificantlyDamaged	NETN_Float64BE	The number of significantly damaged resources
NumberDestroyed	NETN_Float64BE	The number of destroyed or consumed resources
ResourceName	HLAUnicodeString	The name of the resource

### 9.4.10 SensorStructArray1

An array of elements of DataType SensorStruct with cardinality 1+

### 9.4.11 SensorStruct

Name	Type	Semantics
SensorStateEnum	SensorStateEnum32	The operational status of the sensor
SensorDamageState	DamageStatusEnum32	The damage status of the sensor
SensorCoverage	Float2	The maximum range of the sensor
SensorID	HLAUnicodeString	A sensor owned by the aggregate

### 9.4.12 SupportRelationshipStruct

Name	Type	Semantics
SupportConsumer	NETN_UniqueID	The unique ID of the consumer of the support.
SupportProvider	NETN_UniqueID	The unique ID of the provider of the support.
SupportType	SupportRelationshipEnum8	The type of support provided by the supporting unit.

Note: Padding check needed after SupportConsumer

### 9.4.13 VisualSignatureStruct

Name	Type	Semantics
DVOSignaturePercent	NETNPercentage	A summary percentage of an aggregates susceptibility to detection by direct view optics, i.e. the human eye, binoculars, or telescopes. A unit with zero percent signature would be concealed from DVO detection.
I2SignaturePercent	NETNPercentage	A summary percentage of an aggregates susceptibility to detection by Image Intensifying sensors. A unit with zero percent signature would be invisible to image intensifiers (I2).
ThermalSignaturePercent	NETNPercentage	A summary percentage of an aggregates susceptibility to detection by thermal sensors. A unit with zero percent signature would be invisible to thermal sensors.

## 9.4.14 WorldLocationStructArray2

An Array of element type WorldLocationStruct with cardinality 3+

## 9.4.15 WorldLocationStruct

Name	Type	Semantics
X	Double2	Distance in meters from the center of the earth projecting through 0 degrees latitude and 0 degrees longitude.
Y	Double2	Distance in meters from the center of the earth projecting through 90 degrees east longitude and 0 degrees latitude.
Z	Double2	Distance in meters from the center of the earth projecting through the geographic North Pole.

## 9.5 Entity Object Class Extensions

### 9.5.1 RPR-FOM Platform Object Class Extension

The following RPR-FOM platform object class extensions have been made:

Full Name
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.Aircraft.NETN_Aircraft
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.AmphibiousVehicle.NETN_AmphibiousVehicle
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.GroundVehicle.NETN_GroundVehicle
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.MultiDomainPlatform.NETN_MultiDomainPlatform
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.Spacecraft.NETN_Spacecraft
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.SubmersibleVessel.NETN_SubmersibleVessel
HLAobjectRoot.BaseEntity.PhysicalEntity.Platform.SurfaceVessel.NETN_SurfaceVessel

All of the above extensions include the following attributes:

Attribute	Data Type	Default Value (if Optional)	Semantics	Usage
Activity	AggregateMissionEnum16	(Not Optional)	The activity of the object.	Required
Callsign	HLAUnicodeString	(Not Optional)	The name of the object.	Required
EmbeddedUnitList	ArrayOfEmbeddedUnit	0	List of unique IDs of on-board elements	
Status	AggregateStatusEnum8	1	If an instance shall be taken into account by federates	

### 9.5.2 RPR-FOM Lifeform Object Class Extension

The following RPR-FOM lifeform object class extensions have been made:

Full Name
HLAobjectRoot.BaseEntity.PhysicalEntity.Lifeform.Human.NETN_Human
HLAobjectRoot.BaseEntity.PhysicalEntity.Lifeform.NonHuman.NETN_NonHuman

All of the above extensions include the following attributes:

Attribute	Data Type	Semantics
Callsign	HLAUnicodeString	The name of the object.
Status	AggregateStatusEnum8	If an instance shall be taken into account by federates
Activity	AggregateMissionEnum16	The activity of the object.

## 9.6 Combat adjudication

This section discusses combat adjudication between objects owned by different federates. This design pattern has not been verified by MSG-068 but is included here as a reference. Any use of this design pattern should consider the fact it has not been thoroughly tested.

Use cases are defined as follows to decompose the problem:

"Case 1" consists of two federates which both publish and subscribe to Platform object A "platform object" is any of the BaseEntity.PhysicalEntity.Platform subclasses belonging to the NETN\_Aggregate FOM, e.g. BaseEntity.PhysicalEntity.Platform.GroundVehicle.NETN\_GroundVehicle sub-classes. This case is addressed by the existing RPR FOM WeaponFire and MunitionDetonation interactions.

"Case 2" consists of two federates which both publish and subscribe to the NETN\_Aggregate object class. This case requires extensions as follows:

- A. Case 2A involves ground-to-ground combat (between two Aggregate objects owned by different federates). The section below entitled "Combat Adjudication Service Federate (CASF)" proposes a means for avoiding the "fair fight" problems caused by modeling differences between the federates which may give an unfair advantage to objects owned by one federate over those owned by the other.
- B. Case 2B involves an engagement between objects usually modeled as entities (even in an "aggregate" simulation) and an aggregate. If this is an inaccurate assumption, that is if a federate is unable to publish and subscribe to ships and aircraft as platform objects, other extensions to the BaseEntity.AggregateEntity class will probably be necessary. For example, a ship fires naval gunfire at a ground unit or an attack helicopter firing an AGM-114 Hellfire missile(s) at a tank in a mechanized task force comprised of tanks, infantry fighting vehicles (IFVs), and trucks. The (relatively) small number of munitions fired in such an engagement recommends use of the existing RPR FOM interactions with an extension as described in the section entitled NETN\_MunitionDetonation below.

"Case 3" consists of two federates which publish and subscribe to dissimilar object types. That is, one federate publishes and subscribes to the Platform sub-class and the other publishes and subscribes to the NETN\_Aggregate object class. In this case the objects owned by one federate may not acquire the object(s) owned by the other federate. Without acquisition, conflict is impossible even in circumstances where combat should occur. Engagements in this case will be resolved through use of the "Combat Adjudication Service Federate (CASF)."

The table below summarizes the proposed approach for the different use cases and engagement types.

Engagement Type		CASE 1	CASE 2	CASE 3
Air-to-Air	A2A	Resolve internally	2B: Resolve internally	CASF
Air-to-Ground	A2G	Resolve internally	2B: Resolve internally	CASF
Air-to-Naval	A2N	Resolve internally	2B: Resolve internally	CASF
Ground-to-Air	G2A	Resolve internally	2B: Resolve internally	CASF
Ground-to-Ground				
Indirect Fire Only	G2GI	Resolve internally	2B: Resolve internally	CASF
Direct Fire	G2GD	Resolve internally	Case 2A: Use CASF	CASF
Ground-to-Naval	G2N	Resolve internally	2B: Resolve internally	CASF
Naval-to-Air	N2A	Resolve internally	2B: Resolve internally	CASF
Naval-to-Ground	N2G	Resolve internally	2B: Resolve internally	CASF
Naval-to-Naval	N2N	Resolve internally	2B: Resolve internally	CASF



## 9.6.1 Combat Adjudication Service Federate (CASF)

This section introduces a means of adjudicating combat engagements between:

- NETN\_Aggregate objects owned by different federates (CASE 2A)
- a NETN\_Aggregate owned by one federate and one or more platform-level objects are owned by another federate (CASE 3)

A federate capable of adjudicating ground-to-ground combat, hereafter referred to as the Combat Adjudication Service Federate (CASF), must subscribe to the NETN\_Aggregate and Platform object classes. The CASF must also utilize the NETN Service Consumer-Provider pattern as follows:

- In CASE 2A, if a NETN\_Aggregate owned by one of the federates acquires a NETN\_Aggregate owned by the other federate and wishes to engage it in combat, it will initiate a *NETN\_RequestService* interaction to which the CASF must respond with a *NETN\_OfferService* interaction.
- In CASE 3, CASF will initiate a *NETN\_OfferService* interaction offering to adjudicate the combat between the two federates whenever two or more objects owned by different federates should engage in ground-to-ground combat according to its (CASFs) algorithms.

Assuming the negotiation process results with a *NETN\_AcceptOffer* interaction (there will obviously be several assumptions and conditions surrounding this service; these will be addressed below), the CASF will adjudicate the combat according to its algorithms and inform the owning federates of adjudication results and ammunition consumed. ("inform the owning federates" is used because of the current prohibition against shared object ownership. Recommend abolishing that constraint and enabling transfer of health state and on-hand supply attributes to CASF in conjunction with initiating *NETN\_AcceptOffer* interaction).

### Assumptions:

1. CASF is able to utilize the NETN Service Consumer-Provider pattern.
2. CASF is able to subscribe to both platform level and aggregate level object classes and can adjudicate the combat between the object instances.
3. CASF knows enough about the two or more objects to be able to adjudicate combat between them.

What is the minimum set of required attributes necessary to satisfy this assumption?

- a. For all entities (platforms) comprising all units or individual platforms involved in the combat, the following attributes could be important: activity, location, mounted state, weapons control order, status with respect to health, equipment, ammunition, capture, cover, and concealment (from the different sensor types, i.e. the signature values in NETN\_Aggregate).
  - b. The objects engaged in direct fire combat maybe supported by other units, a supporting artillery unit for example, whose support and weapons expenditure should be accounted for by CASF.
4. Both federates accept the *NETN\_OfferService* interaction. An exception, below, addresses what to do if one or more federates refuse the service offer.

### Exceptions:

1. One of the federates refuses the NETN\_OfferService interaction. Recommend an initial implementation of one of three courses of action. A federate which refuses the NETN\_OfferService interaction must necessarily refuse combat by one of means:
  - a. Retreat. This would seem particularly appropriate if an object is advancing, is notified that it is in danger of ground combat, and chooses to retreat along its route of advance so as to avoid combat.
  - b. Surrender.
  - c. Attempt to hide. Consider a scout or small reconnaissance patrol with intent on gaining information on an enemy's activities. The scout or patrol attempts to avoid detection by moving more slowly, concealing its-self, and adopting an appropriate weapons control order. If these attempts are communicated in the appropriate attributes, then it would seem appropriate to allow the opposing forces to operate in close proximity with each other without engaging in combat. It would also seem appropriate to periodically assess whether the reconnaissance element has been discovered and if so, then again initiate the NETN\_OfferService interaction to start ground combat.
2. Both of the federates refuse the NETN\_OfferService interaction. The same three options are available to both federates.

### Variations:

- CASF is itself one of the federates which owns an object(s) that is part of the combat adjudication. CASF initiates the NETN\_OfferService interaction as before and adjudicates the combat if accepted by the other federate. This variation is problematic only insofar as the conflict resolution is thought to be unfair. Recommend an initial implementation consistent with (the same as) CASF acting as a service for other federates and resolving issues if and when they arise. The alternative is dedicating a federate to conflict adjudication which would certainly be more expensive and might preclude using that federate for other federation functionality (if for some reason more than one instance of the federate is not supportable).

## 9.6.2 Area-effects Munitions

Area-effects munitions, whether fired by indirect-fire weapons systems or dropped by air, are typically modeled as discrete munitions and thus may be handled with the existing RPR FOM WeaponFire and MunitonDetonation interactions with the following caveats. Federation agreements are proposed to decrease the number of interactions sent as follows:

- For area-effects munitions fired in support of Aggregate vs. Aggregate combat, WeaponFire and MunitonDetonation interactions will NOT be used. Instead, the firing unit(s) will be included as supporting units as discussed in CASF section above.
- For artillery missions NOT fired in support of Ground-to-Ground Combat, the MunitonDetonation interaction will be used with the QuantityFired parameter sent to the number of rounds in the volley, e.g. for a battalion of 18 howitzers firing a battalion 10, we would expect ten interactions each with QuantityFired equal to eighteen.

For air-delivered "dumb bombs," the QuantityFired parameter will be sent to the number of simultaneously delivered bombs.

Note that in the cases above referencing use of the RPR FOM WeaponFire and MunitonDetonation interactions, we will use the convention that both interactions are necessary only if the munition will be

instantiated as a BaseEntity object, otherwise the firing federate need only initiate the MunitionDetonation interaction.

## 9.7 Interaction Extensions

### 9.7.1 NETN\_CombatResult

The NETN\_CombatResult is a subclass of NETN\_Service and is initiated by CASF to communicate engagement results. CASF will usually send at least two interactions; one to each of the participating federates though for protracted engagements, CASF may send periodic interactions providing incremental engagement results. In all cases, the interaction consists of personnel, equipment, and supply status changes as a result of the engagement. Inherited attributes are shown in italics.

Parameters	Data Type	Default value (if optional)	Definition
<i>ServiceID</i>	<i>EventIdentifierStruct</i>	<i>(NotOptional)</i>	<i>Unique identifier for a service</i>
<i>Consumer</i>	<i>NETN_UniqueID</i>	<i>(NotOptional)</i>	<i>Entity that has requested the service</i>
<i>Provider</i>	<i>NETN_UniqueID</i>	<i>(NotOptional)</i>	<i>Providing or intended provider entity</i>
EngagementResults	EngagementResultsList Struct	0	The list of unique IDs damaged in the engagement together with their associated damage.
SuppliesConsumed	SupplyStructArray1	0	The supplies consumed during the engagement.

### 9.7.2 EngagementResultListStruct

An array of elements of Datatype EngagementResultStruct with cardinality 0+.

### 9.7.3 EngagementResultStruct

Name	Type	Semantics
UniqueID	NETN_UniqueID	The unique identifying alphanumeric code of the referenced object.
DamageState	DamageStatusEnhancedEnum32	The damage state of the referenced object.

### 9.7.4 SupplyStructArray1

An array of elements of Datatype SupplyStruct with cardinality 0+.

### 9.7.5 SupplyStruct

Name	Type	Semantics
SupplyType	EntityTypeStruct	The type of supply (as described in the Bit Encoded Values for Use with Protocols for Distributed Interactive Simulation Applications)
Quantity	Float4	The number of units of the supply type. The unit measure depends on the supply type and shall use the SI units of measurement used for such supplies.

### 9.7.6 NETN\_MunitionDetonation

The NETN\_MunitionDetonation, extends the existing RPR FOM interaction to enable Entity versus Aggregate combat engagements, that is, an Entity firing individual munitions against a unit comprised of equipment vulnerable to that munitions type. The extension is necessary to distinguish between the different equipment types in the aggregate which may be vulnerable to the munitions. For example, an attack helicopter armed with AGM-

114 Hellfire missiles attacking a mechanized task force would logically fire at tanks first, then infantry fighting vehicles, then trucks. Including the preferred target list in the munitions detonation allows communication of the tactical intent. If possible, the receiving federate should adjudicate the munitions effects against the first entity type on the list closest to the DetonationLocation of the munition.

Parameters	Data Type	Semantics
UniqueID	NETN_UniqueID	The unique identifying alphanumeric code of the aggregate for electronic transmissions.
PreferredTargetList	EntityTypeStructArray	A prioritized list of target types



**Network Infrastructure Design Document**

**for**

**NATO Education and Training Network (NETN)**

Developed by MSG-068 NETN – Infrastructure Working Group

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## 2 Definitions and Abbreviations

ACT	Allied Command Transformation
ASTi	Advanced Simulation Technology, inc.
CFBLNet	Combined Federated Battle Laboratories Network
CLR	CFBLNet Lead Representative
CRC	Central RTI Component (HLA)
CWE	Collaborative Work Environment
DIS	Distributed Interactive Simulation
DNS	Domain Name System
DWG	Documentation Workgroup
FAD	Federation Agreements Document
FTP	File Transfer Protocol
Gbit/s	Giga bit per second
HLA	High Level Architecture
IP	Internet Protocol
IWG	Initiative Workgroup
JCATS	Joint Conflict and Tactical Simulation
JFTC	Joint Forces Training Command
JTLS	Joint Theatre Level Simulation
JWC	Joint Warfare Centre
LAN	Local Area Network
LVC	Live, Virtual, Constructive
Mbit/s	Mega bit per second
MSG	(NATO) Modelling & Simulation Group
MSAB	Multinational Security Accreditation Board
NATO	North Atlantic Treaty Organization
NC3A	NATO Command & Control and Consultation Agency
NETN	NATO Education and Training Network
NMSG	NATO Modelling & Simulation Group
NRF	NATO Response Force
NTP	Network Time Protocol
NWG	Network Workgroup
PoP	Point of Presence
POP3	Post Office Protocol version 3
QoS	Quality of Service
RTI	Run Time Interface (HLA)
SENECA	Simulation Environment for Network-Enabled Capability Assessment (Dutch national NEC network)
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
STANAG	Standard NATO Agreement
SWG	Security workgroup
TG	Task Group
VoIP	Voice over Internet Protocol
VTC	Video Tele Conference
WAN	Wide Area Network





This document is the deliverable of the MSG-068 NETN Infrastructure Working group and provides the infrastructure design and recommendations for implementation.

### 2.1.1 NETN usage

NETN connectivity should be flexible in the sense that nations and organisations that have access to the NETN infrastructure will be able to perform exercises or experiments in different configurations. In some cases all nations may want to join a specific event, in other cases, a (small) numbers of nations may use NETN for a particular training exercise or mission preparation event.

NETN is intended to become a permanent (persistent) NATO capability. The preparation time to set up a particular event should be minimised as a result of the permanent character of NETN. As NETN consists of four projects the initial and full operational capability will be implemented in phases according to the project plans. Testing and incremental implementation/upgrading is expected to take several years. Additional sites and new applications will be added during these years.

### 2.1.2 NETN nations involved

The following nations and organisations were initially involved in NETN when planning was started for the infrastructure design.

**Table 1 nations and organisations originally involved**

Country	NATO Country Code	Number of sites
Australia	AUS	?
Bulgaria	BGR	?
Czech Republic	CZE	?
France	FRA	3
Germany	DEU	3
Italy	ITA	?
NATO	NATO	1
Netherlands	NLD	1
Romania	ROU	?
Slovenia	SVN	?
Spain	SPA	1
Sweden	SWE	?
Turkey	TUR	?
United Kingdom	GBR	?
United States	USA	?

Note: in the final experiments of NETN (2010) several nations moved their assets to other sites and participated from that location.

### 2.2 Applications and information flow

The following applications are foreseen in NETN:

- Simulators (including simulated radio and data links), possibly with hardware in the loop for training purposes. Simulation interoperability will be based on the High Level Architecture (HLA) IEEE 1516 as agreed by STANAG 4603.
- C2 systems, mainly identical to the applications that are used operationally



- Video Tele Conferencing (VTC) for exercise mission briefings, mission planning and after action review.
- Video Tele Conferencing (VTC) for technical briefings, technical planning and technical after action review.
- VoIP for technical management and control (before, during and after the exercise)
- Network remote management, control and monitoring
- Network Time synchronisation (using Network Time Protocol NTP)

Also classified data storage and data exchange for planning, results, documentation etc should be accessible from all sites. This includes:

- E-mail
- Webservers, WIKI based collaborative workspaces
- FTP servers (e.g. to distribute scenario data)

All mandatory applications should be available at all sites.

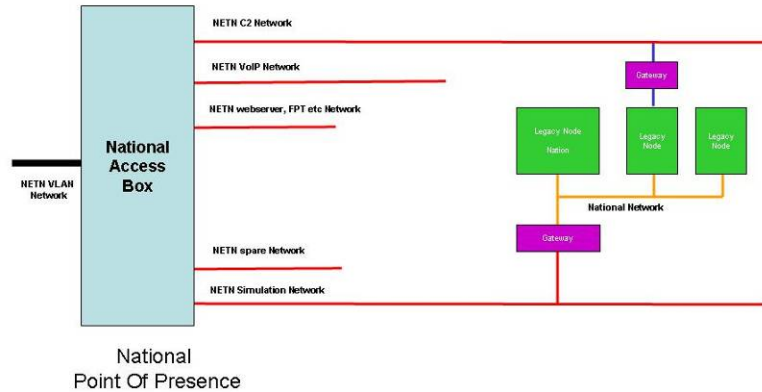
**Table 2 Applications**

Application	Protocols	Remarks
VoIP	Mandatory	
Simulation	Mandatory	HLA IEEE 1516 (according to STANAG 4603) using a FOM based on the NETN reference FOM which is based on RPR-FOM 2d17. Note: legacy systems using DIS or HLA 1.3 need adapters/bridges/gateways.
C2, Datalinks	Mandatory	HLA IEEE 1516 (according to STANAG 4603) using a FOM based on the NETN reference FOM which is based on the HLA Link 16 BOM (SISO-STD-002-2006). Note: legacy systems using SIMPLE, MTDS, or NACT need adapters/bridges/gateways.
Radio Simulation	Mandatory	HLA IEEE 1516 (according to STANAG 4603) using a FOM based on the NETN reference FOM which is based on RPR-FOM 2d17. Notably ASTi systems
VTC	Mandatory	
Storage	Mandatory	

**2.2.1 Information flow between applications**

The proposed solution from a user perspective should be to provide a number of physically separated networks that are dedicated to a certain type of information flow. For example a network dedicated to (HLA based) simulation data, another network intended for C2 related data and networks reserved for VoIP, VTC etc. The functionally separated networks would in fact be logical channels that all share the same network infrastructure on the WAN between nations or sites. Network configuration control would allow a flexible allocation of WAN bandwidth to specific data channels. This method would provide maximum bandwidth to the simulation channel during an exercise, while

reallocating this WAN bandwidth to VTC channels during Briefings and Debriefing sessions.



**Figure 1 Assigning WAN bandwidth to logical channels**

### 2.2.2 Information flow between sites

It should be possible that all mandatory applications can function on all sites involved in a particular NETN event. The network should be 'fully meshed' and suitable for classified data exchange among all sites.

### 2.2.3 Bandwidth

Several applications require significant bandwidth. However, the required bandwidth depends on the training scenarios and the applications that are in use for the scenario. In most cases, not all of the applications listed above will be operational at the same time (e.g. VTC and Simulations). The NETN infrastructure should allow a flexible allocation of the available WAN bandwidth to different applications depending on the needs. The WAN bandwidth capacity should be scalable and upgrades or downgrades should be relatively painless.

### 2.2.4 Delay (latency) and jitter

Several applications are time critical therefore the delay or latency and especially jitter should be kept at as low as possible. Typical maximum acceptable latency values for real-time (man-in-the-loop) simulations are 100ms between any two applications. The performance levels should be guaranteed to a defined minimum or maximum, thus providing a certain Quality of Service (QoS).

### 2.2.5 Availability and Reliability

The NETN is intended for training purposes. It should be available and reliable for continuous periods of several sequential days. The mean downtime should be minimal and downtime due to maintenance etc should be planned in advance and needs to be scheduled in agreement with the user community.

### 2.2.6 Security

NETN should be able to handle SECRET data. Nations or organisations that are not involved in a particular event taking place on the NETN infrastructure should not have access to the data related to that event.

### 3 National Defense network infrastructure overview

Nations and Organisations often use an isolated part of their national defense network infrastructure to form distributed education and training capability able to support training. The isolation is primarily required to avoid disruption of operational systems and capabilities and provide a controlled sandbox for the distributed education and training capability. This paragraph visualise the main characteristics<sup>i</sup> from the national and organisational network in support of Allied and Coalition Education, Training, and /or Research and Development within nations/organisation.

This chapter provides an overview of several national networks as identified by the national experts of the MSG-068 Network Infrastructure subgroup.

#### 3.1.1 National and Organisational Network Infrastructures

##### 3.1.1.1 Australia

Defence Wide Area Communications Network (DWACN). Externally the Combined Federated Battle Lab (CFBL) network has also been used for international DSTO networking exercises.

##### 3.1.1.2 Bulgaria

##### 3.1.1.3 Czech Republic

##### 3.1.1.4 France

EXAC C3R Secure Network for Experiment and Referentiel d'Interoperabilite Technique (RIT). The Celar, Bruz element of EXAC C3R is also the France PoP in the Combined Federated Battle Laboratories Network (CFBLNet), enabling connection to this Multi-National Network.

##### 3.1.1.5 Germany

German Experimental Network which is a VPN based network over the German Defense WANBw (WAN Bundeswehr) and/or Digitales Ubertragungs Net Bundeswehr. The German Experimental Network could also use public infrastructure with VPN technology. The main Point of Presence of the German Experimental Network Euskirchen, is also the German PoP in the Combined Federated Battle Laboratories Network (CFBLNet), enabling connection to this Multi-National Network.

##### 3.1.1.6 NATO

3.1.1.6.1 NATO General Communications System (NGCS) is the basic communications infrastructure for all NATO communications. It addresses voice and data transmission requirements, circuit-switched and packet-switched, for both unclassified and classified (up to NATO SECRET) communications. NGCS connectivity ranges from Norway to Greece and from Norfolk, Virginia in the US to Kabul in Afghanistan including all NATO Commands and Primary facilities plus most of the NATO nations MOD. The operation and maintenance of NGCS is the responsibility of the NATO CIS Services Agency (NCSA). On request NGCS can support Exercises and Training capacity for and between NATO Commands and facilities.

3.1.1.6.2 NATO Combined Federated Battle Laboratories Network (CFBLNet) provides the NATO and European main Point of Presence for NATO organisations, NATO nations and mission partners. High speed Wide Area Network links are used to interconnect the CFBLNet participants. NATO Facilities typically utilises the NGCS network (preferred) or dedicated leased lines to connect to the NATO CFBLNet PoP located in NATO C3 Agency ,The Hague, Netherlands.

##### 3.1.1.7 The Netherlands

The Netherlands uses a CFBLNet extension for all experiments to connect military sites inside the Netherlands with each other and also to other countries through



CFBLNet. This network is called SENECA/CFBLNet and is a 1Gbit/s Virtual Private Network (VPN) special created for this purpose on top of a 10 Gbit/s MOD network and is available on almost all MOD sites. At this time 8 sites are connected and this could become more in the near future. SENECA/CFBLNet is connected to the NATO CFBL PoP at NC3A in The Hague through the NLD-PoP. Several security enclaves are available on top of this SENECA/CFBLNet.

3.1.1.8 Romania

3.1.1.9 Slovenia

3.1.1.10 Spain

There are several sites in Spain involved in coalition experimentation.

3.1.1.11 Sweden

The Point of Presence of the Sweden armed forces Enkoping, is also the Swedish PoP in the Combined Federated Battle Laboratories Network (CFBLNet), enabling connection to this Multi-National Network.

3.1.1.12 Turkey

3.1.1.13 United Kingdom

The UK Joint Multi-National Information Assurance Network (JMNIAN) is a project managed by the Integration Authority's (IA) Defence Test and Reference Co-ordination Office (DT&R CO). It provides a secure Asynchronous Transfer Mode (ATM) Wide Area Network (WAN) that will connect Test & Reference sites. Points of Presence (PoPs) at test sites provide connectivity to the WAN. The JCMB ARTD element of JMNIAN is also the UK PoP in the Combined Federated Battle Laboratories Network (CFBLNet), enabling connection to this Multi-National network. Key features of JMNIAN are: It has a high bandwidth, and can operate in near real-time; It supports a variety of standards/protocols, such as Serial, ISDN and IP; It will be accredited to SECRET.

3.1.1.14 United States

3.1.1.14.1 Defense Information Systems Network (DISN)

DISN as DOD's networking capability for the transfer of information in support of military operation in the context of the Global Information Grid (GIG). It further specifies that DISN shall be the means for wide-area and metropolitan-area networking.

3.1.1.14.2 Joint Training and Experimentation Network (JTEN)

JTEN is the communications network for the Joint National Training Capability (JNTC), U.S. Joint Forces Command (USJFCOM). This network will be interconnected with CFBLNet July2009 in support of Coalition JTEN Initiatives.

3.1.1.14.3 Combined Federated Battle Labs Network (CFBLNet) environment which utilizes a

distributed Wide Area Network (WAN) as the vehicle to experiment with new capabilities by conducting Research and Development, Trials and Assessment including Training initiatives. The U.S. CFBLNet infrastructure is extensive and reaches to international demarcation points for the Southern Hemisphere and Europe.

## 4 Selection of Network Infrastructure for NETN

### 4.1 International Network infrastructure overview

This chapter looks into network solutions for the international infrastructure which were identified by the experts of the MSG-068 Network Infrastructure subgroup.

#### 4.1.1 CFBLNet



Figure 2 CFBLNet logo

The Combined Federated Battle Laboratories Network (CFBLNet) is a network build, maintained and constantly improved by its members. The network is available for experiments and training with different classifications and markings. Several nations and NATO organizations have permanent connections to CFBLNet, while others establish a connection when needed. CFBLNet is more than a network, It features standard services like, Network management, Crypto management, DNS, Web, E-Mail, Voice, FTP, Network Time server and VTC(on request). CFBLNet has an efficient organisation, proven processes and documents and includes a CFBLNet secretariat to assist the users in its optimum use of the CFBLNet capabilities. It has extensive knowledge on coalition classified networks, security accreditation and rules, crypto technology and interactions between simulators and network protocols. The use of CFBLNet for NETN may at first glance look expensive, but the countries already connected to CFBLNet use the network and organisation for multiple initiatives. A new initiative like NETN should consider that the fixed costs are already paid for. CFBLNet allows using various WAN links, including leased lines, SatCom, NGCS, (and tunnelling using the internet (with special measures)). CFBLNet is a closed network. CFBLNet provides you an established, stable international network with proven information assurance measures, and the support of a robust environment. This results in a sustainable and creditable architecture to effectively field equipment and services.

CFBLNet has been used to minimize risk in systems prior to deployment to the war fighter; reducing costs and countless hours of development. CFBLNet has an effective method for integrating and improving interoperability with allied and coalition partners. CFBLNet has hosted many multi-national C4ISR events and has a track record of success that speaks for itself:

- CWID
- Fleet Synthetic Training-Joint
- Multi-National Experiment
- Empire Challenge
- Blue Force Tracker
- NATO ALTBMD



The CFBLNet has supported several key warfighting Initiatives, including: multi-national connectivity for air picture; messaging services; collaboration; multi-level security Initiatives; homeland defense and crisis response tools; ship-to-ship command and control; unmanned aerial vehicle imagery; and situational awareness via enhanced tactical data link interoperability. Imagery and video systems proven on CFBLNet are currently supporting operations in Afghanistan and Iraq. The network also supported key second-tier warfighting objectives including on-line distributed war gaming and multinational training exercises. Some specific success stories include the following:

- Intelligence, Reconnaissance and Surveillance (ISR) lessons learned in live and unmanned aircraft and satellite surveillance in Empire Challenge 06 were applied immediately in support of International Security Assistance Force (ISAF) – Afghanistan.
- In Project Churchill, the US-UK bilateral trials led to enhanced communications capabilities for Unmanned Combat Air Systems.
- The United Kingdom International Support Team (UK-IST III) and the US conducted experiments that established real time wargaming for C2, consultation, and future consequence mitigation.
- NATO is very successfully using CFBLNet for the NATO ALTBMD program, where CFBLNet interconnect all involved ALTBMD sites and support HLA/DIS, link, voice, VTC and other traffic to the network distributed systems, including hardware in the loop (HWIL) within the involved nations.

#### **4.1.2 NGCS**

NATO General Communications System (NGCS) is the basic communications infrastructure for all NATO communications. It addresses voice and data transmission requirements, circuit-switched and packet-switched, for both unclassified and classified (up to NATO SECRET) communications. NGCS connectivity ranges from Norway to Greece and from Norfolk, Virginia in the US to Kabul in Afghanistan including all NATO Commands and Primary facilities plus most of the NATO nations MOD. The operation and maintenance of NGCS is the responsibility of the NATO CIS Services Agency (NCSA). On request NGCS can support Exercises and Training capacity for and between NATO Commands and facilities.

NGCS is evolving their capabilities to the NATO Network Enabled Capability Network and Network and Information Systems Infrastructure (NNEC-NII) which is based on the NCGS Protected Core Network (P-Core), an MPLS Transport backbone with Traffic Engineering extension. The evolving capability, expected to be fully available 2012/2013 will support the coloured cloud principle on top of the transport network. The main Coloured clouds will be NS, NU/NR and MS. In support of specific requirements or for training, exercises and events, VPN can be provisioned with the main clouds (equal classification/releasability) or separate Coloured clouds can be provisioned for other classification/releasability or specific requirements. For these separated Coloured clouds the management aspects needs to be taken into account.

The NGCS Transport and Coloured clouds fully support Quality of Service (QoS), are Service Level Managed with SLA's from a NGCS Services catalogue providing SLA templates.

The NGCS P-Core going to be coupled with the national defense networks with the use of Packet Network gateways capability. Initial on L2 level best effort (phase I: 2010), later also on Layer 3.

Topic of attention:

- Accreditation is required for applications.
- Restrictions and issues connecting simulations and operational systems
- Intended for use between NATO sites rather than national assets.

#### 4.1.3 BICES



Figure 3 BICES logo

Battlefield Information Collection and Exploitation Systems (BICES) is an operational NATO network. The objective of BICES is to share and exchange information / intelligence among the participating Nations and with NATO in peace, crisis and war through the use of interoperable Automatic Data Processing (ADP) based national and NATO intelligence support systems. BICES is a network reserved for operations and not for experiments or training. This implies that applications and systems need accreditation before they can be used on BICES. BICES is not available on many sites that were listed for NETN.

#### 4.1.4 GEANT



Figure 4 GEANT logo

GEANT provides low latency and high throughputs, which makes it suitable for distributed test beds with unclassified and near real-time requirements. GEANT is the interconnecting network to the national academic research networks like for instance SurfNET in the Netherlands. However, several issues have been identified in GEANT:

- There is not always a guaranteed bandwidth, latency or Quality of Service available.
- Many countries do not allow SECRET networks operating over open networks or networks connecting the internet. GEANT has interconnections to internet.
- GEANT and its national networks are an academic research network and is not available on military sites (only research institutes and universities)





#### 4.1.5 Public Internet

The public Internet is readily available at almost any location on earth. The connection costs are in general very low. The issues regarding the use of the public Internet for NETN are:

- There is no guaranteed bandwidth, latency or Quality of Service available. Contracts with Internet Service Providers (ISPs) do not in general provide solid performance guarantees.
- Many countries do not allow SECRET networks operating over open networks or networks connecting to the internet.

Remarks: USA and UK have stated that classified simulation assets are not allowed to have connections to open internet. The Open Internet and VPNs have been used for several experiments (e.g. FMV SmartLab Sweden).

#### 4.1.6 Proprietary networks on leased lines

Proprietary networks on leased telecom lines can be made available at almost any location on earth. The connection costs are in general significant. The issues regarding the use of proprietary networks for NETN are:

- Guaranteed bandwidth, latency and Quality of Service are in general available at a price.
- A management organisation needs to be in place to negotiate contracts with telecom operators and deal with technical issues and maintenance.

#### 4.2 International Network infrastructure selection

The table below compares the international network solutions for NETN which were presented above.

**Table 3 Network comparison**

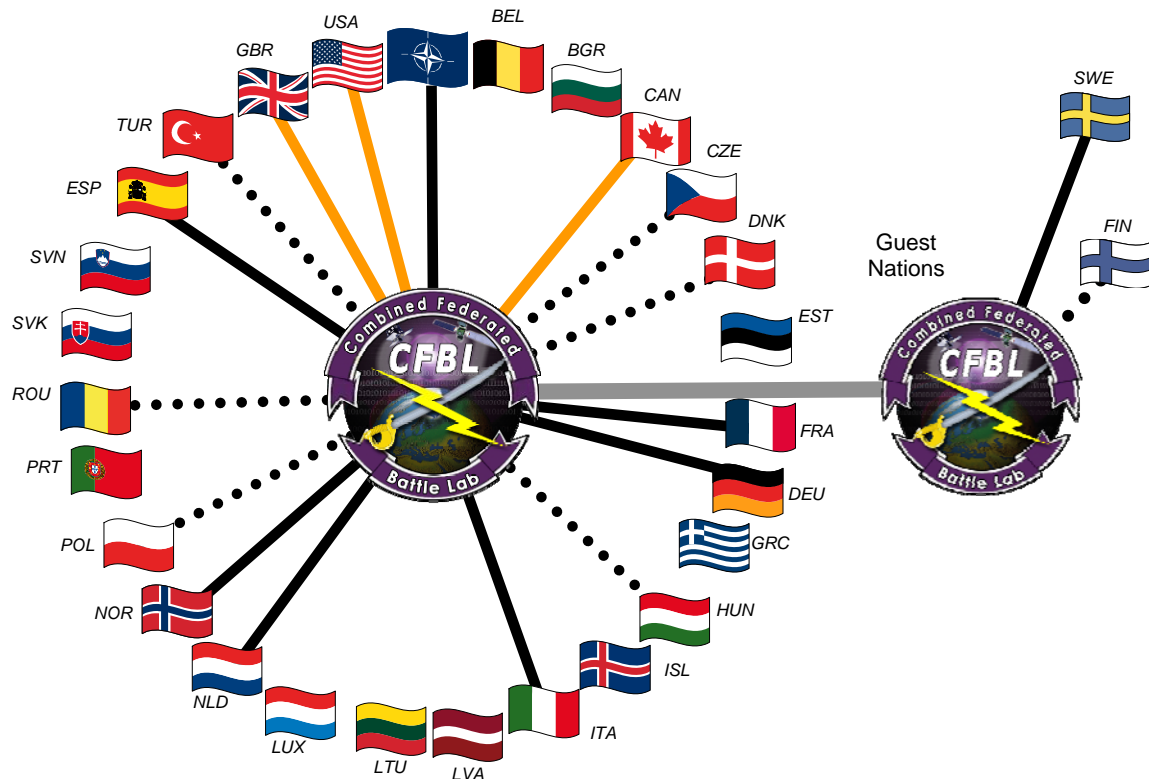
	CFBLNet	BICES	NGCS (current)	NGCS (NNEC-NII)	GEANT	Internet	Leased lines
Network physical available	YES	YES	YES	YES	YES	YES	YES
Network available to all NETN participants	YES	NO	YES <sup>1</sup>	YES	YES (through internet)	YES	YES
Allowed to carry SECRET information by national security rules	YES	YES	YES	YES	NO	NO	YES with additional security measures
Organisation has knowledge of classified networks	YES	YES	YES	YES	NO	NO	NO
Ownership	All MODs connected	NATO	NATO	NATO+ MOD connected		ISPs	Telecom operator
Black Network management	Available	Available	Available	Available	Not available	Not available	Not available
Security organisation in place	YES	YES	YES	YES	NO	NO	NO
Security measures and procedures in place	YES	YES	YES	YES	NO	NO	NO

Given the NETN requirements and the comparison of the available infrastructure options, the MSG-068 Infrastructure Working group has decided to base the design of the network infrastructure on the Combined Federated Battle Laboratory (CFBL) Network. CFBLNet will be the black (unclassified) backbone between participating nations and NATO organisations. The next chapters will discuss the infrastructure design in more detail.

<sup>1</sup> Network available to all NATO nations. To non-NATO nations through specific separate domain build or using Information Exchange gateways.

## 5 Combined Federated Battle Laboratories Network (CFBLNet)

The Combined Federated Battle Laboratories Network (CFBLNet) is a network build, maintained and constantly improved by its members. The network is available for experiments and training with different classifications and markings. Several nations and NATO organizations have permanent connections to CFBLNet while others establish a connection when needed.



**Figure 1 CFBLNet countries, NATO nations and Partners perspective (January 2009)**

### 5.1 History

In April 1999, the US made a proposal to the NATO C3 Board to establish a Combined Federated Battle Laboratories Network (CFBLNet). The Concept was to build on the Combined Wide Area Network (CWAN) that had been established each year for JWID, to establish a year-round network for research, development, trials, and assessment operating at a Combined Secret Releasable accreditation level.

The participants would include the US, the Combined Communications-Electronics Board (CCEB), and NATO. NATO in the CFBLNet context, are all individual NATO nations and NATO the organisation. The Network would be used to develop coalition interoperability, doctrine, procedures and protocols that can be transitioned to operational coalition networks in future contingencies.

The CFBLNet will leverage Coalition Warrior Interoperability Demonstration (CWID), formerly JWID, resources and existing NATO and national laboratories and test beds. It is not a US owned network. As a combined network, the participants will have equal say in its utilization and management, yet specific initiatives may be configured between any numbers of participants. The CFBLNet participants are to respect sovereign and intellectual property rights of activities conducted on the network.

### 5.2 CFBLNet organisation

The CFBLNet will fall under the oversight of a CFBLNet Senior Steering Group (C-SSG), comprised of three Flag level executives representing U.S., NATO, and CCEB. Control of the CFBLNet will be conducted by a CFBLNet Executive Group (C-EG) of 06 (or equivalent) level members also representing US, NATO and CCEB, working for the C-SSG members. The C-EG may stand up subordinate groups as required.

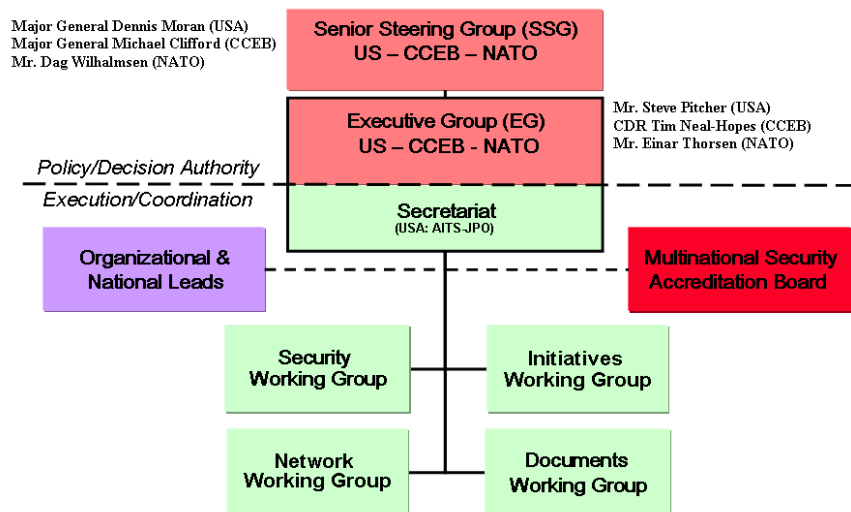


Figure 2 CFBLNet organisation (2008)

There are several roles in the CFBLNet organisation. These roles are:

- The CFBLNet Lead Representative (CLR) is responsible for coordination within the CN/O; Initiatives, work, equipment, crypto, accreditation, etc.
- The Networking Working Group (NWG) is responsible for building and maintenance the required network and enclaves.
- The Security Working Group (SWG) is responsible for the security on the network (PoP) and in the enclaves.
- The Document Working Group (DWG) is responsible for correct documentation
- The Initiative Working Group (IWG) is responsible coordination of initiatives
- The national Multinational Security Accreditation Board (MSAB) representative is responsible for accreditation of the national sites and initiatives.

One of the big advantages of this construction is that several national MSAB representatives taking part in the Security Working Group (SWG) and are at the CFBL Management Meetings each 6 month.



Multinational Security Accreditation Board

### 5.3 CFBLNet Architecture and Terminology

CFBLNet is a network build and maintained by its members. The network consists of sites, national *Point of Presence* (PoPs), infrastructure, services and knowledge management. The national / organisational PoP is the connection from the national / organisational *Wide Area network* (WAN) to the international part of the CFBL WAN.

#### Backbone Infrastructure

The *BLACKBONE* (= Black backbone) provides a common, closed, unclassified IP routed network layer implementation using a mixture of both ATM and IP bearer networks. Its primary purpose is to transport encrypted traffic throughout the network.

*Enclaves* are the cryptographic protected networks on top of the CFBLNet BlackBone. Each enclave has a *classification* and a *marking* indicating security level and the countries allowed connecting.

*Initiatives* use the Enclaves to exchange data.

#### 5.3.1 CFBLNet Levels

##### 5.3.1.1 CFBLNet Level 0 the international network

The CFBLNet level 0 network is the network between nations and/or NATO organisations. There are three regional PoPs (Europe, North America and Oceania) connecting the nations / organisation PoPs. The national / organisation PoPs connect the nations / organisation sites to the international.

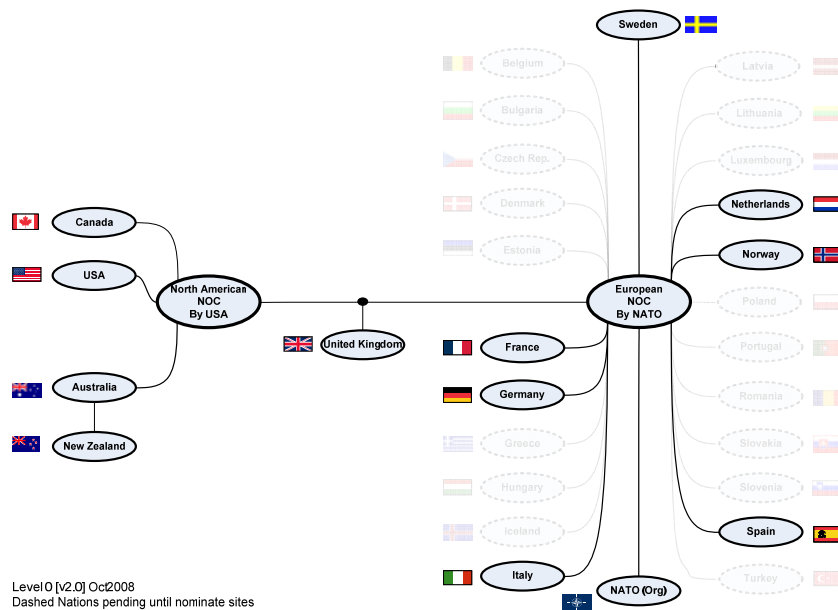


Figure 5 Level 0 connections (December 2008)

### 5.3.1.2 CFBLNet Level 1 the national network

The CFBLNet level 1 network is the network between national PoPs and the national sites. The national PoP's network and sites are maintained by national CFBLNet organisation.

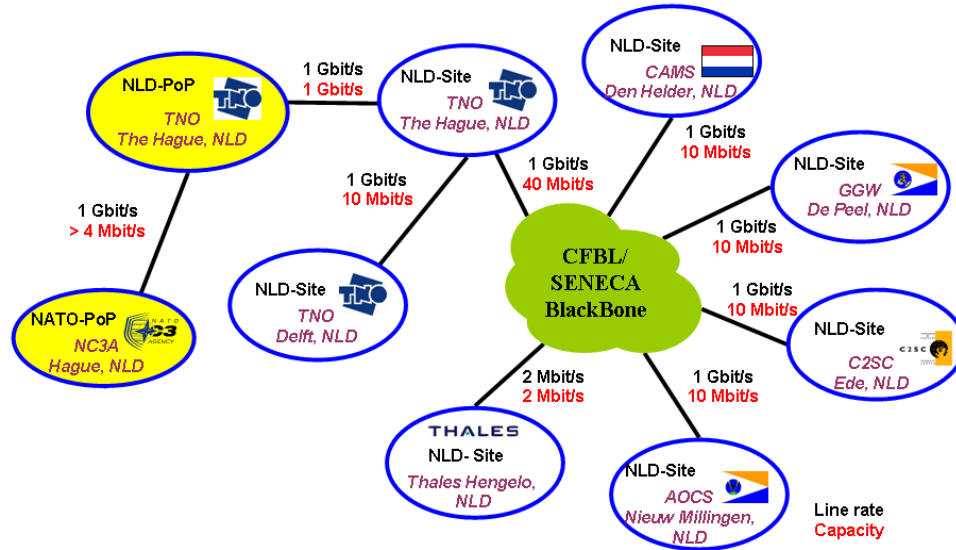


Figure 6 NLD example Level 1 connections (January 2009)

### 5.3.1.3 Level 2 is the site network

The CFBLNet level 2 network is the network at the national sites. The architecture differs for almost all sites but it consists at least of a black router, a crypto and a red router.

## 5.3.2 Enclaves

There are several security enclaves on CFBLNet.

- The CFBLNet BLUE enclave is a permanent classified IP routed logical network operating over the BLACKBONE. It will operate as a System High logical network at the SECRET level, releasable to AUSCANNZUKUS + NATO;
- The CFBLNet RED enclave is also a permanent classified IP routed logical network operating over the BLACKBONE. It will operate as a System High logical network at the NATO SECRET level.
- The CFBLNet Unclassified Enclave (CUE). The CUE is a permanent enclave operating over the BLACKBONE.
- Temporary enclaves are created for a finite period to support the execution of specific Initiatives and operating over the BLACKBONE. The level of classification and release caveats used within these enclaves will be determined by the Initiative requirements.
  - The CFBLNet GREEN enclave is a temporary classified IP routed logical network operating over the BLACKBONE. It will operate as a System High logical network at the SECRET level, releasable to AUSCANNZUKUS + NATO + Sweden;



#### 5.4 CFBLNet countries and sites involved

Currently, there are already many sites connected to CFBLNet.

Nation/Organization	Number of Sites
Australia (AUS)	13
Canada (CAN)	29
United Kingdom (GBR)	37
New Zealand (NZL)	6
Germany (DEU)	17
Spain (ESP)	3
France (FRA)	3
Italy (ITA)	8
NATO	9
Netherlands (NLD)	8
Norway (NOR)	7
Poland (POL)	1
Sweden (SWE)	1
USA	22
<b>Total</b>	<b>164</b>

**Figure 7 Connected sites to CFBLNet (October 2008)**

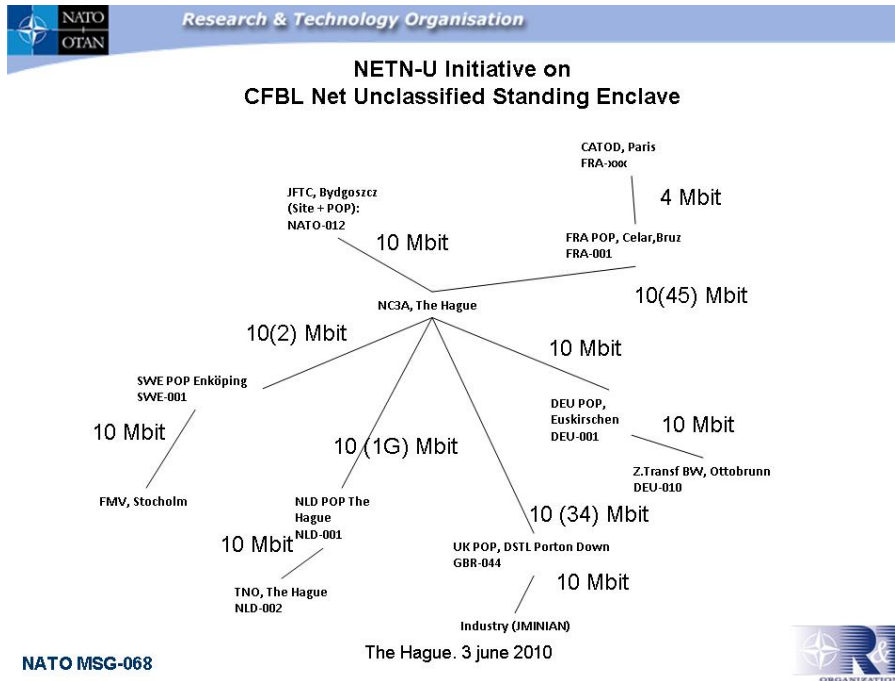
Detailed up-to-date information regarding the countries and sites connectivity to CFBLNet and Point of Contact data is available through the CFBLNet organisation.

## 6 NETN Network design

### 6.1 Introduction

The design of the NETN infrastructure is based on the assumption that the Combined Federated Battle Laboratory (CFBL) Network will be the black (unclassified) backbone between participating nations. Each participating nation will, or has already, acquired the necessary routers, switches, crypto devices and workstations to meet the respective national requirements for installation, connection and operation of the CFBL network at the nation's respective sites. The NETN network design will be used as the basis for future M&S applications as planned within ACTs NETN initiative.

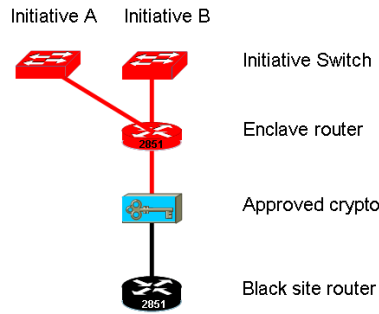
The MSG-068 Infrastructure Subgroup developed the initial network topology design for the Experiments. Given the nature of the experiments (unclassified, technical feasibility demonstration) and the available resources, the decision was taken to establish the NETN Infrastructure on an existing CFBLnet Unclass Enclave (CUE), also known as White Enclave ((future) Standing Class Enclave). The necessary paper work (CFBLnet Initiative Information Package CIIP) was produced in collaboration with the nations and the CFBLnet organization. The proposed topology with planned bandwidths is shown in the diagram below. Note that a permanent Infrastructure solution should establish a dedicated NETN Enclave under CFBLNet to simplify and streamline the process of setting up an exercise or experiment.



### 6.2 Network concept

The idea is to create a new permanent enclave for coalition purposes. At this moment there are several enclaves on the CFBLNet BlackBone. The enclave suitable for this is the temporary enclave CFBLNet GREEN. The enclave CFBLNet GREEN ends in the red router. At the red router are several Virtual Private Networks (VPNs) available, all with the same releasability. One of the VPNs is NETN. Each initiative has its own end switch.





**Figure 8 network level 2**

The black router, crypto and enclave router are managed by CFBLNet. The initiative switch is managed by the initiative. This concept permits that a NETN network-manager is able to manage the NETN network within the agreed boundaries. An example is that the NETN network-manager stops all Conference calls and adds all bandwidth to the training simulators to prevent hiccups in the exercise. After the training session the VTC is allowed to access the NETN network for after action review. There are also possibilities to automate this process.

Another advantage of this concept is that hardware and software for services like “Voice over IP” (VoIP), the Video teleconference manager, Network time server, and so on can be used for multiple parallel initiatives while the data (with the same level and releasability) itself is not mixed. This will reduce costs for everybody.

### 6.2.1 Hardware

The proposed hardware for a new site is mentioned below.



**Figure 9 Black site router examples**

The Black site router is the CISCO 2851 or 3845 (for E3 connection) router. This router is power full enough to handle the high speed encrypted data streams. (IOS=enterprice)



**Figure 10 Enclave Crypto**

The enclave crypto is the TCE621B (or C) for Europe and the TACLANE E100 for the USA.



**Figure 11 Enclave router**

The enclave router is the CISCO 3845 or ASR 1002 router. This is a powerful router capable of handling multiple VPNs and tunnels.

The initiative switch has to be divined. The switch should have “power over Ethernet” to support IP phones.



**Figure 12 Default enclave IP phone**

### **6.3 Security**

Each national site is responsible for the certification and accreditation of their respective sites in accordance with their national directives. Each nation is responsible for submitting the site national accreditation endorsement certificate (S-NAEC) and the initiative national accreditation endorsement certificate (I-NAEC) for each participating site. The S-NAEC is the authority to connect to the CFBL network, while the I-NAEC is the authority to operate and participate in an approved CFBL initiative.

Each nation will maintain a security posture in accordance with CFBL instructions and national policies.

The network design is based on a fully meshed red network between the crypto devices at all event sites to prevent a single point of failure causing connectivity issues. Dynamic routing protocols will be utilized vice static routes whenever possible.

Each nation is responsible for obtaining the proper crypto devices. Network separation is provided by the different key-mat authorized for the different initiatives.

#### **6.3.1 Accreditation**

Each country is responsible for accreditation of its national sites. If a site does not have a valid accreditation certificate the site should be disconnected from CFBLNet.



**6.3.2 Classification**

The classification of the NETN environment is “SECRET”

**6.3.3 Marking**

Because Sweden is not a NATO country the marking is “releasable to NATO and SWE”. The strong recommendation is to include all future CFBLNet nations in this enclave to avoid security and releasability issues in the future.

**6.3.4 Crypto**

Event sites are connected by a fully meshed, dynamic protocol routed network. This allows the exchange of routing information to prevent a single point of failure from preventing connectivity between all sites when a site(s) is not operating properly, due to accreditation or technical issues.

The network is protected by approved crypto and operates in a “system high” concept. The preferred crypto is the TCE 621b for Europe. NC3A can bridge this to a TACLANE for the USA.

**6.3.5 Key material**

The key material for the TCE 621b will be supplied by NATO. The key material for the TACLANE will be supplied by the USA (MNIS-JPO).

The key material for the crypto devices is provided and authorized by the NATO C3 Agency or by the Multi National Information Sharing Joint Program Office (MNIS JPO) in the United States and distributed to all nations according to authorized memorandums of agreement/procedures, through secure crypto channels. A valid S-NAEC and I-NAEC are required in order to obtain crypto key material. The point of contact for CFBLNet key material distribution:

NATO C3 Agency:

**Table 4 Crypto custodians**

<b>NATO CFBLNet Comsec PoC:</b>	
Department/Group/Organization	NATO C3 Agency
Name including title:	Mr Edgar Harmsen
Commercial Phone Number:	+31 70 374 3488
Internet Email Address:	<a href="mailto:Edgar.Harmsen@nc3a.nato.int">Edgar.Harmsen@nc3a.nato.int</a>
<b>Comsec Custodian PoC:</b>	
Department/Group/Organization	NC3A Custodian
Name including title:	Mr Cor Westenberg– Comsec Custodian
Commercial Phone Number:	+31 70 374 3231
Internet Email Address:	<a href="mailto:Cor.Westenberg@nc3a.nato.int">Cor.Westenberg@nc3a.nato.int</a>



USA:

**Table 5 Crypto custodians**

<b>Comsec Custodian (MNIS-JPO):</b>	
Department/Group/Organization	MNIS- JPO (US)
Name including title:	Ron Watkins - Primary Comsec Custodian
Commercial Phone Number:	+1 703 284 8772
Internet Email Address:	<a href="mailto:rwatkins@hai.com">rwatkins@hai.com</a>
<b>Comsec Custodian (MNIS-JPO):</b>	
Department/Group/Organization	MNIS- JPO (US)
Name including title:	Charles Plummer – Secondary Comsec Custodian
Commercial Phone Number:	+1 703 284 7004
Internet Email Address:	<a href="mailto:cplummer@hai.com">cplummer@hai.com</a>

### 6.4 Protocols and Services

#### 6.4.1 Protocol translation

The applications in the NETN environment use protocols that are routable (broadcast is not routable). This means that no protocol translation is needed when required.

#### 6.4.2 Protocol support

The port-numbers of expected protocols to be used are listed below. The port-numbers can be used to filter data and segregate different data streams into separate VLANs and Ethernet ports in the initiative switch as required.

- NTP = 123
- FTP = 21
- DNS = 53
- SNMP = 161
- SMTP = 25
- POP3 = 110
- WEB = 80
- VoIP = ?
- VTC = ?

Simulation protocols used in previous projects on CFBLNet:

- DIS = 3005 (Not used in NETN)
- ASTI = 5001 (Not used in NETN)
- Link 11 = 1000 Link16 = 10000 (Not used in NETN)
- HLA pitch commander = 8070 (agent on each host running federate), 8071 (Commander)
- TNO RTI (HLA) = 3100 (RTI exec), 3101 and 3102 (RTI fedex), 3103 (for forwarding)
- Mäk RTI (HLA) = 4000



Especially for the simulation protocols the port numbers to be used in a NETN experiment have to be documented in the Federation Agreements Document (FAD) corresponding to that specific experiment.

### 6.4.3 Quality of Service (QoS)

It is proposed to place applications in different classes to prioritize network access and services for there applications. This is used to automate the bandwidth assignment.

**Table 6 Access classes (example)**

Class	Application	Remarks
High	VTC, VoIP, Radio Simulation (HLA, ASTi)	Low latency
Medium	Simulation (HLA)	
Best Effort	E-mail	

### 6.4.4 Network Services

The network services available at this time on CFBLNet are:

- VoIP
- NTP
- VTC
- HTTP
- Mail
- FTP

All Network Services to be provided by the NETN network infrastructure are listed in 7.2.

### 6.5 Data flow and capacity

To make a total design the required services and their use (number of terminals connected / used at the same time / the location) are needed. This gives a better perception of the data flow between sites and the capacity needed to support the services, training and education systems. This information should be documented in tables like shown below. Actual data are not provided here for classification reasons.



**Table 7 Capacity between countries (Level 0)**

Country	NATO Country Code	Capacity Mbit/s to CFBLNet
Australia	AUS	(data removed)
Bulgaria	BGR	(data removed)
Czech Republic	CZE	(data removed)
France	FRA	(data removed)
Germany	DEU	(data removed)
Italy	ITA	(data removed)
NATO	NATO	(data removed)
Netherlands	NLD	(data removed)
Romania	ROU	(data removed)
Slovenia	SVN	(data removed)
Spain	SPA	(data removed)
Sweden	SWE	(data removed)
Turkey	TUR	(data removed)
United Kingdom	GBR	(data removed)
United States	USA	(data removed)

**6.5.1 MTU size enclave routers**

The MTU size for the enclave routers will be 1368 bytes. (Explanation removed due to declassification)

**6.5.2 MTU size enclave crypto**

The MTU size for the enclave crypto will be 1476 bytes. (Explanation removed due to declassification)

**6.6 Network topology**

**6.6.1 Black Network (International network)**

The diagram below shows the top-level design of the NETN VPN on top of the CFBLNet GREEN enclave on top of the CFBLNet BlackBone. Each nation will be connected to the NETN CFBLNet through its national access point or Point-of-Presence (PoP). The PoP will either connect to a national asset located at that site or will provide the interface to the national network infrastructure which connects national assets.

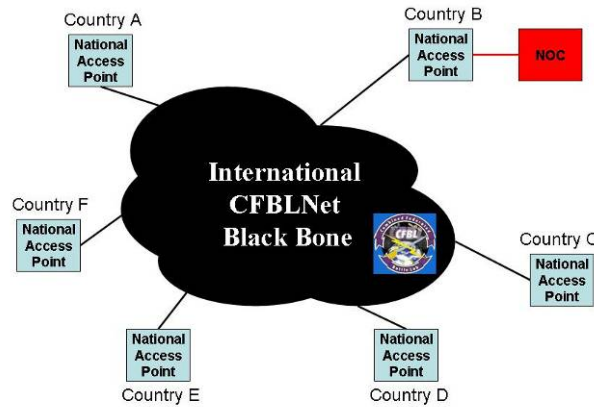


Figure 13 Top level diagram of WAN

The diagram below shows a more detailed representation of the CFBLNet BlackBone infrastructure that provides the NETN Enclave.

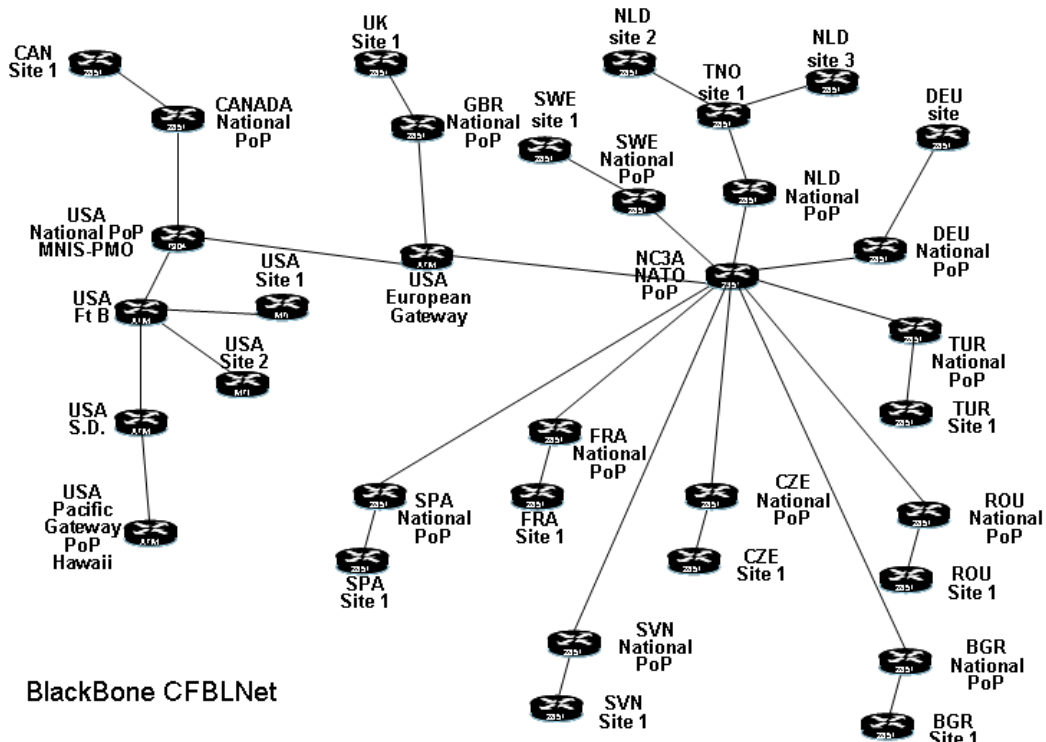


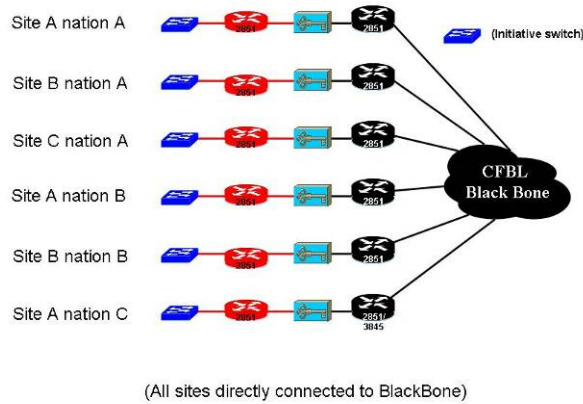
Figure 14 CFBLNet BlackBone infrastructure for NETN (not completed)

### 6.6.2 Crypto network

The crypto network topology is the way the crypto's are connect to each other. There are two options based on the national security policy.

### 6.6.2.1 Direct connections

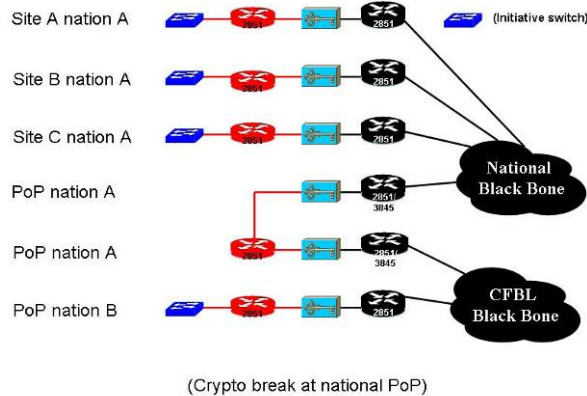
The first option is to make direct connections between all sites (international). Each site has a crypto and is connected to all other sites. The national PoP can have a crypto as well, but the data can go directly from site “1” in country “A” to site “1” in country “B”.



**Figure 15 Crypto Direct Connection**

### 6.6.2.2 Connections through the national PoP

The second option is to make a connection through the national PoP and then to the national sites. Each site has a crypto and is connected to the crypto in the national PoP. Another crypto in the national PoP has connection to the crypto’s in the PoP or sites in other countries. This means that data from site “1” in country “A” first goes to the national PoP and is then sent to the other country. Nations may use a national crypto system on the national network. Nations can also include specific data filters or other types of data protection or data translation devices at the PoP.



**Figure 16 Crypto Indirect Connection (Crypto Break)**

### 6.6.3 Enclave router network

Each enclave router has tunnels to all other enclave routers to provide services needed in the enclave. The enclave router also separates the different VPN using the enclave.



## 7 NETN Network Management and Network Support Services

### 7.1 NETN Network Operation Centre (NOC)

The NETN Network Operation Centre (NOC) is a PC connected somewhere in the NETN network managing the NETN initiative switch and services.

### 7.2 NETN Network Services

The following network services are managed by NETN. Some of them are already part of the standard services provided by CFBLNet.

The Network Services used in an experiment have to be clearly documented in the federation specific FAD.

#### 7.2.1 Domain Name System (DNS)

Used for the translation from host names to IP addresses.

#### 7.2.2 Simple Network Management Protocol (SNMP)

Used for monitoring network-attached devices for conditions that warrant administrative attention.

#### 7.2.3 File Transfer Protocol (FTP)

An FTP server has to be available on the NETN network to which FTP clients can connect for downloading and uploading files.

#### 7.2.4 E-Mail

A mail server (POP3 and SMTP) has to be available on the NETN network.

#### 7.2.5 Voice over IP (VoIP)

Service for maintenance, tech. support and exercise management.



Figure 17 Default enclave IP phone

A Central Call manager facility should be provided. The NOC site would be most logical location.

#### 7.2.6 Network Time Protocol (NTP)

NTP time is available through the network and provided by CFBLNet. In time critical applications an extra local time source is needed (e.g. a GPS synchronised local clock). An example is the Meinberg M300 NTP server using GPS to synchronise.



Figure 18 Meinberg M300 GPS NTP server

The need for such a local service depends on the NETN requirements

### 7.2.7 VTC

For briefing & debriefing in a distributed environment it is important that participants are presented with presentation slides (e.g. package lead briefing) and an overall tactical display. Video teleconferencing (VTC) is necessary for interactive discussions concerning the mission plan and after action review (AAR). Obviously, all of these interactions fall under the same security requirements as the mission itself. For this reason, the secure network is also used for the VTC and briefing distribution. Besides communication of the mission plan and evaluation of the executed mission, VTC is also important as part of Exercise Control and for managing technical issues.

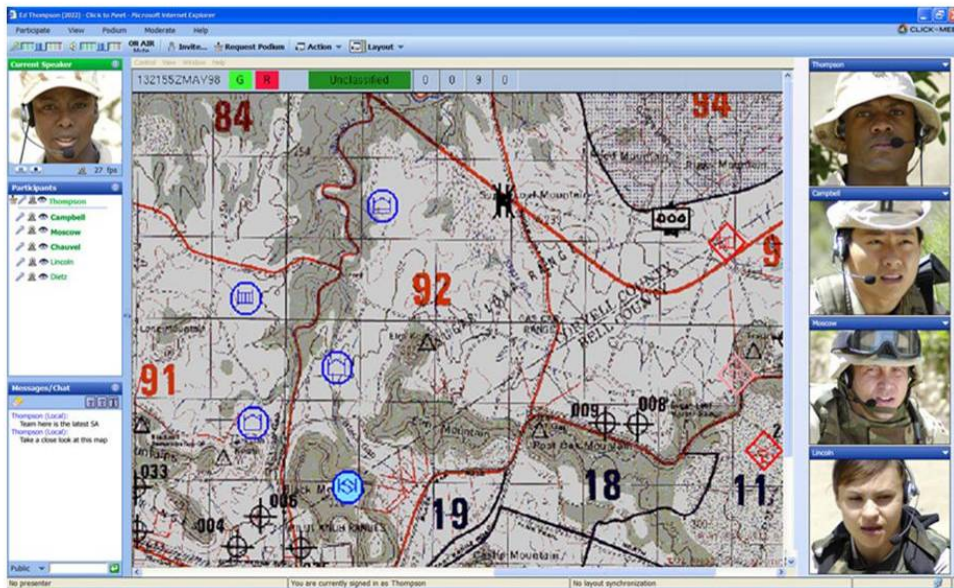


Figure 19 Example VTC Application "Click to Meet"

### 7.2.8 Wiki Webserver

A wiki webserver providing a Collaborative Work Environment (CWE) has to be available on the NETN network. The CWE can have a general part for looking up all kind of useful information for example about the FOM and each experiment can have its specific part on the CWE to share for example simulation results. The current MSG-052 and MSG-068 CWEs could be the basis of such a CWE.

### 7.2.9 Quality of Service

Network management refers to the activities, methods, procedures and tools that pertain to the operation, administration, maintenance and provisioning of networked systems.

Operation deals with keeping the network (and the services that the network provides) up and running smoothly. It includes monitoring the network to spot problems as soon as possible.

Administration deals with keeping track of resources in the network and how they are assigned. It includes all the “housekeeping” that is required to keep the network under control.

Maintenance is concerned with performing repairs and upgrades. For example, if equipment must be replaced or patches applied to operating systems or router/switch IOS's. Maintenance also includes corrective actions and preventive measures to make the managed network run better.

Provisioning is concerned with configuring resources in the network to support a given service.

This network document, while not all inclusive, is meant to provide the basics of network operations and governance of the networks while conducting NETN events.

### 7.2.10 Network Monitoring

Each nation will be responsible for monitoring and maintaining network operations within their national boundaries. MNIS JPO is responsible for monitoring and maintaining the black (unclassified) network backbone connectivity. The national CFBLNet engineer will provide the black side IP address schema and coordinate with the various national sites involved in NETN events to ensure proper blackside router configurations to properly pass encrypted data traffic and routing information.

The NETN NOC will monitor the initiative (classified) network.



**Figure 20 MRTG logo**

Software to monitor the initiative switch is for instance MRTG. This is free software. It is able to monitor all port on all initiative switches and presents the results on a web server for easy user access on daily, weekly, monthly and yearly bases.

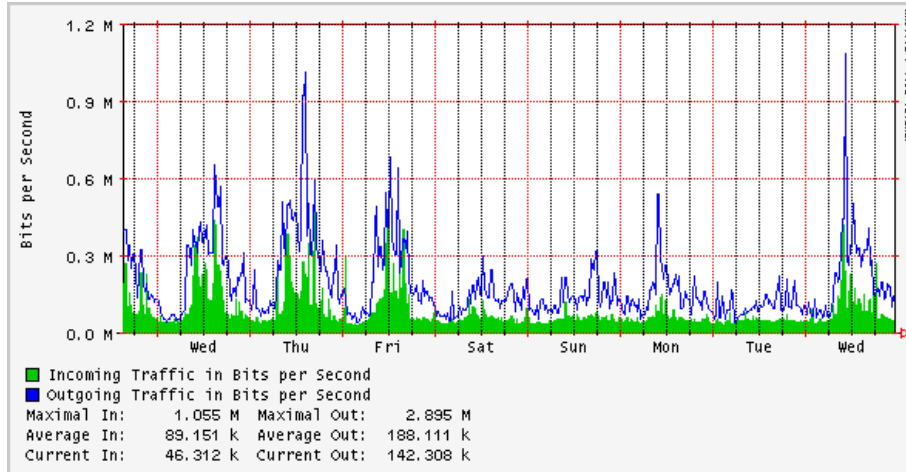


Figure 21 MRTG example weekly bases



Figure 22 WhatsUp logo

Other available monitor software is “WhatsUp”. This is not free software. It is able to show the network configuration and services. It also has a web server for easy user access.

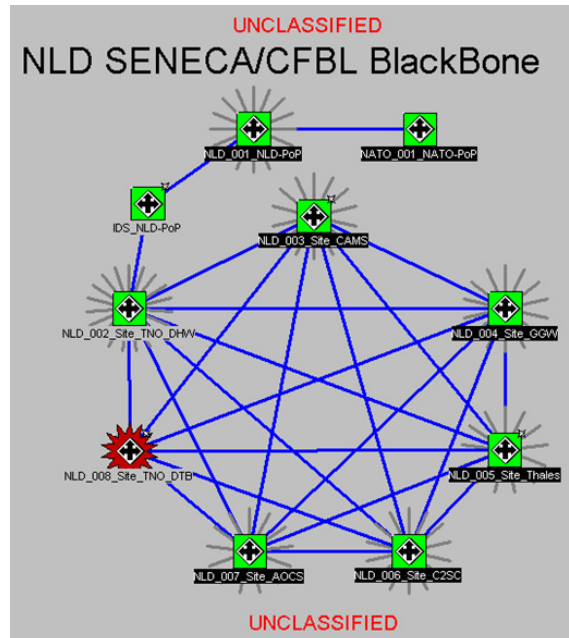


Figure 23 WhatsUp example for NLD black network



## 8 NETN Simulation Interoperability and Simulation Support Services

### 8.1 *Simulation Interoperability*

NETN federations are based on NATO STANAG 4603 which states that High-Level Architecture IEEE 1516 shall be used as the standard for developing and federating simulation systems.

Non-HLA or legacy HLA (i.e. HLA 1.3) federates can participate in the simulation using appropriate bridging and/or adapter technologies on the national network. Any bridging required in order to adapt federates to IEEE 1516 shall be the responsibility of the integrating federate.

#### 8.1.1 HLA-RTI and Central RTI Component (CRC)

NATO STANAG 4603 implies that a certified Run Time Infrastructure (RTI) will be used to provide HLA IEEE 1516 interoperability. For each NETN experiment the RTI to be used has to be agreed on and this choice is part of the Federation Agreements. Any bridging or adaptations of federates to the selected RTI shall be the responsibility of the integrating federate.

Most HLA implementations include a Central RTI Component (CRC) to provide HLA services like Time management. Unless running a connectionless RTI mode this component represents the RTI Executive and is the initial point of access to a federation. If required the CRC will be running at the NOC.

#### 8.1.2 HLA-RTI and Local RTI Component (LRC)

The Local RTI Component (LRC) is an integral part of the Federate Application and is usually started in the same process space as the federate itself. Usually this service is not documented explicitly in the FAD unless the LRC does more than expected like loading a plugin for SOM to FOM translation.

#### 8.1.3 HLA-RTI and Web Service Provider RTI (WSPRC)

Web Service Provider RTI Component (WSPRC) is an RTI component used when offering the RTI services using the standard IEEE 1516 Web-Service API.

### 8.2 *Simulation Support Services*

Simulation Support Services are processes (software) which must be executed in parallel to the federate processes to enable a federation execution or which are required to support individual simulations in the federation to enable them to participate in a federation according to the agreements.

The NETN infrastructure will not provide any Simulation Support Service by itself and it is up to each NETN experiment which Simulation Support Services are used and made available as long as HLA IEEE 1516 is used as the simulation standard. Below some typical Simulation Support Services are mentioned, but it is the responsibility of the participants and not of the NETN network to provide these services.



The Simulation Support Services used in an experiment have to be clearly documented in the federation specific FAD.

### **8.3 Execution Control**

Execution Control software provides a facility to remotely startup, monitor, and shutdown federates. Participant nations can be required to install 'daemon software' on each machine that would be running a federate. It is up to each NETN experiment whether execution control is needed. An example of such a product is 'Pitch Commander'.

### **8.4 Database Services**

Specific database services may be needed for providing initialization data (e.g. scenarios, terrain databases, weather data, weapon system parameters, etc.) or logging purposes. Access to the database services may given be through different means (e.g. SQL, webservices, etc.). An example is the Logger tool 'Pitch Recorder' that uses a MySQL database for storage.

### **8.5 Bridge or Gateway Services**

Bridging/gateway/adaptor services (either as a bi-directional transfer or as a data diode) may be required at federation start-up. Examples are:

- ° HLA 1.3 <=> HLA IEEE 1516
- ° FOM X <=> FOM Y
- ° DIS <=> HLA
- ° TENA <=> HLA
- ° RTI X <=> RTI Y
- ° SIMPLE <=> HLA LINK 16 BOM

## 9 NETN Infrastructure Budget Requirements

### 9.1 CFBLNet Business model

The business model for NETN is that all participants carry their own cost to establish the connectivity. CFBLNet is built with a cost sharing philosophy with pay as you go: every participant (NATO nation, NATO organisation and Guest Nations fulfil their own cost to connect and together they share the common cost (total shared cost/numbers users). The National/Organisation cost is internally handled.

National Cost:

- Non-recurring:
  - National Infrastructure
  - Initial installation
- Recurring:
  - Link cost to nearest PoP.
  - Monthly subscription cost (shared element).

### 9.2 CFBLNet Subscription Costs

#### 9.2.1 CFBLNetwork Cost Estimates

The cost estimate is made under the condition that a 10 Mbit/s capacity is needed for NETN.

The subscription costs for CFBLNet (2009) are:

- One time Installation cost: EURO 4k (E3 connection)
- Monthly fee
  - 4 Mbit/s (default): EURO 7k
  - 10 Mbit/s (during training) EURO 9k

These Subscription costs are covering the shared Infrastructure hardware/software, CFBLNet Management and Coordination, helpdesk, standard services including Network Management, encryption, routing, DNS, mail, voice (over IP (VoIP)), Web and FTP services, Network time protocol (NTP) and full transparent access to the CFBLNet core network including transatlantic connections. On request VTC can be added as a service. The Installation cost include extensive coordination and installation efforts to get the links and backbone routers interconnected and configured between the national PoP and the CFBLNet PoP facilities.



**Figure 24 NATO and European CFBLNet Point of Presence.**

A permanent subscription provides standard access to the:

- CFBLNet Backbone (IPv4 (IPv6) transport network)
- CFBLNet CUE (Unclassified Enclave all participants)
- CFBLNet BLUE \* (Coalition Secret Rel. ASCANZUKUS+NATO (nations and organisation))
- CFBLNet RED \* (NATO Secret Rel. NATO (nations and organisation))

\* Access when applicable

However, a permanent subscription on CFBLNet is already in place for most of the NETN countries. This means that these CFBLNet costs can be shared with other initiatives in that country (e.g. CWID). Maybe additional CFBLNet cost for extra bandwidth is needed during execution. As an example for these nations with a permanent CFBLNet subscription the NETN cost would only be EURO 9k / Month per 10Mbit/s during training. This depends from country to country. Contact you national CFBL representative for more information.



**Table 8 CFBLNet subscription**

Country	NATO Country Code	Permanent CFBLNet subscription in place
Australia	AUS	YES
Bulgaria	BGR	NO
Czech Republic	CZE	NO
France	FRA	YES
Germany	DEU	YES
Italy	ITA	YES ?
NATO	NATO	YES
Netherlands	NLD	YES
Romania	ROU	NO
Slovenia	SVN	NO
Spain	SPA	Not permanent
Sweden	SWE	Not permanent
Turkey	TUR	NO
United Kingdom	GBR	YES
United States	USA	YES

### 9.2.2 International network Costs

The cost for the international connection between the nation and the CFBLNet hub at NC3A (The Hague, The Netherlands) is often already paid for by the national part of the CFBLNet organisation. This means that these CFBLNet costs can be shared with other initiatives in that country. The connection costs for each country are for that country. As an example, the network cost for a connection between NC3A and Istanbul for an E3 (34 Mbit/s) leased line will amount to about EURO 4k / month with a contract for at least one year. Note that the available capacities of lease lines is 2, 8, 10 (different technology) or 34 Mbit/s. In general, the 34Mbit/s line has the best price-performance. On request, CFBLNet could provide the link between your National PoP/Site and the NATO and European CFBLNet PoP. However, experience learned that national service providers, through National MOD's, provide better arrangements.

### 9.2.3 National network Costs

The cost for the national connection is often already paid by the national part of the CFBLNet organisation. This means that these CFBLNet costs can be shared with other initiatives in that country. The site connection costs are for the country. No additional fee is required for that national connection to NC3A.

### 9.2.4 CFBLNet National PoP / Access node considerations

Depending on the national organisational arrangements a nation can decide to initially connect only one national site to CFBLNet. If more national sites would like to participate it is recommended to establish a National PoP.

#### 9.2.4.1 National CFBLNet PoP setup cost

Cost of equipment for PoP differs from country to country and the national security rules. To setup a CFBL PoP starts with about 30K EURO for hardware and software

9.2.4.2 National CFBLNet Site setup cost

Cost of equipment for a new site is around 30K EURO for hardware and software

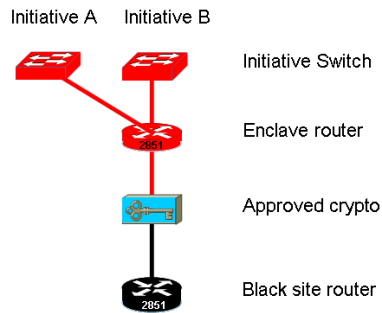


Figure 25 Site network equipment



## 10 Referenced publications

1. CFBLNet-Pub1-Main-V5.0-U
2. CFBLNet-Pub1-AnnexA-V5.0-U
3. CFBLNet-Pub1-AnnexB-V5.0-U
4. CFBLNet-Pub1-AnnexC-V5.0 Appendices-U
5. CFBLNet-Pub1-AnnexC-V5.0-U
6. CFBLNet-Pub1-AnnexD-V5.0 Appendices-UNRI
7. CFBLNet-Pub1-AnnexD-V5.0-U
8. CFBLNet-Pub1-AnnexE-V 5.0
9. CFBLNet-Pub1-AnnexF-V5.0
10. CFBLNet-Pub1-AnnexG-V5.0-U
11. NATO STANAG 4603 – HLA
12. IEEE 1516 HLA
13. IEEE Std 1278.1a-1998  
IEEE Standard for Distributed Interactive Simulation – Application Protocols  
18 august 1998, New York
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**Network Infrastructure Test Protocol Document**  
**for**  
**NATO Education and Training Network (NETN)**

Developed by MSG-068 NETN – Infrastructure Working Group

Roel Wymenga (TNO)  
Wim Huiskamp (TNO)  
Per Philip Sollin (Pitch Technology)



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Appendix E.1	NETN Server Hardware
Appendix E.2	NETN Client Hardware
Appendix E.3	NETN Infrastructure Test Tool Specifications
Appendix E.4	Measured Average Delay between National PoPs over CFBLNet



## 2 Introduction

This document is a deliverable of the MSG-068 NETN Infrastructure Working group and provides a detailed infrastructure test protocol description and recommendations for its implementation. The document refers to the NETN Infrastructure Design that was proposed and discussed in [\[Annex D MSG-068 NETN Network Infrastructure Design Document\]](#).

Note that within the given constraints of time and resources, the NETN Infrastructure team has performed a subset of these tests during the preparation and the execution of the MSG-068 NETN experiments in Nov 2010. The test results as collected for the NETN infrastructure used in the experiment are included in the final paragraph of this document.





### 3 Test protocol Overview

There are two kinds of network tests foreseen. The first is before the initiative starts (pre initiative test) and the other is during the initiative (monitoring test).

The pre initiative test is to determine the default parameter values as available bandwidth protocols and services. The monitoring test is to detect problems. This monitoring information can then be used to solve (network or application) problems immediately if possible or the use this information to improve new initiatives.

It is difficult to describe a standard ('one size fits all') test protocol because initiatives are so different. In this document examples are presented to take care of most common issues in an initiative.

#### 3.1 *Pre initiative test*

In the pre initiative test the following parameters are essential to predict the influence of the network on most applications. The requirements and implementation determine if all tests should be done.

- Maximum Bandwidth
  - For different protocols (TCP, UDP)
  - For different data classes
- Delay between all sites for different packet sizes
- Routing (unicast, multicast)
- Protocols (TCP, UDP, multicast, broadcast)
- Reachable services (NTP, DNS, x, x, x)
- Max MTU size / fragmentation

These tests should be carried out on the classified side of the network. If this is not possible due to accreditation issues an indication on the unclassified side can be used for the following parameters:

- Bandwidth
- Delay to all sites

#### 3.2 *Monitoring test*

In the monitoring test the following information of the classified network is important to find problems:

- Used Bandwidth for the protocols used



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- Delay between all sites
- Reachable services
- Fragmentation

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## 4 Test protocol

### 4.1 Security

Be aware that no unclassified computer is connected to the classified network!  
Be aware that no classified computer is connected to the unclassified network!

Do not use DHCP on computers. Different IP address ranges are the first line of defense for computers connected to the incorrect network!

### 4.2 Hardware needed

- Unclassified PC (any computer)
- Classified PC (any computer)
- Classified SERVER LINUX
- Classified SERVER WINDOWS SERVER 2008

For information about the server hardware see Appendix E.1.

### 4.3 Network and test device initialization

#### 4.3.1 Routers and switches

Do NOT set router and switch Ethernet ports to auto. This often shows bad behavior when the network becomes “loaded”.

#### 4.3.2 Computers and SERVERS

Do NOT set Computers and SERVERS Ethernet ports to auto. This often shows bad behavior when the network becomes “loaded”.

### 4.4 Network pre initiative test

#### 4.4.1 Check router tables black routers

The command “ship route” should show all active routs to all connected routers.

#### 4.4.2 Check router tables red routers

The command “ship route” should show all active routs to all connected routers.



#### 4.4.3 Black site Connectivity and delay

The 'Ping' is a simple test and gives information about the connectivity and delay between two systems. The protocol used is ICMP and is based on UDP. The Ping command is available on each Windows and Linux PC. This test also shows if there is a problem with a crypto or Ethernet network port along the way.

PING all connected routers in the unclassified network to test if all sites can be reached.

The PING also provides "min", "average" and "maximum" round trip delay times. The PING length should be set to the following length:

PING		Remarks
Size	RTT	
100 bytes		
500 bytes		
1000 bytes		
2000 bytes		
3000 bytes		
5000 bytes		

If this test shows a loss of data then there is probably a network port set to "auto" in the path. If there is packet loss the problem should be solved before the other tests could be done.

#### 4.4.4 Red site Connectivity and delay

PING all connected routers in the classified network to test if all sites can be reached. The PING also provides "min", "average" and "maximum" round trip delay times. The PING length should be set to the following length:

PING		Remarks
Size	RTT	
100 bytes		
500 bytes		
1000 bytes		
2000 bytes		
3000 bytes		
5000 bytes		

If this test shows a loss of data then there is probably a network port set to "auto" in the path. If there is packet loss the problem should be solved before the other tests could be done. Experience has shown that also a crypto could initiate packet loss at longer packets (Restart all crypto's involved).

#### 4.4.5 Unclassified PC configuration

To optimize the network capacity, the maximum transmission unit (MTU) size is determined. This will be done with the program TCP optimizer.

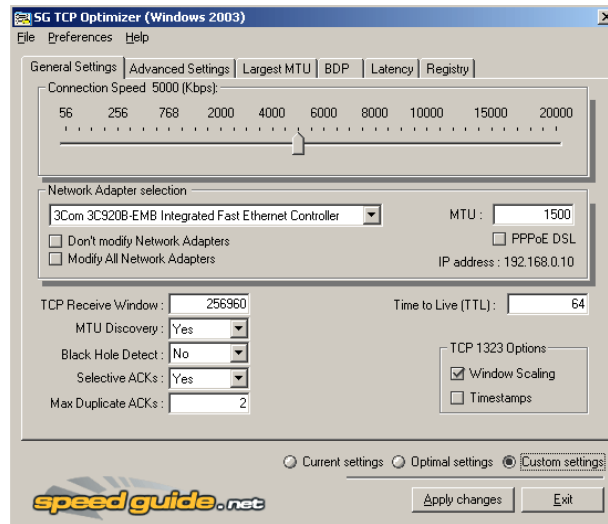


Figure 1 TCP optimizer

After the MTU size determination the connection speed is set to 20.000 and Optimized settings is set and fixed with Apply changes. This initialized the computer for best network performance.

#### 4.4.6 Classified PC configuration

To optimize the network capacity, the maximum transmission unit (MTU) size is determined. This will be done with the program TCP optimizer.

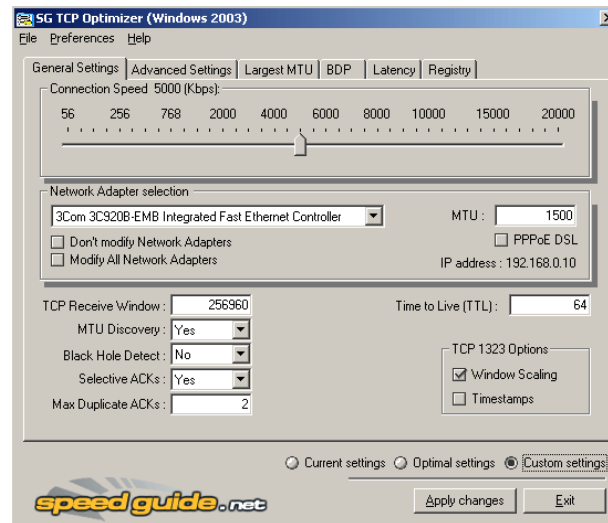


Figure 2 TCP optimizer

After the MTU size determination the connection speed is set to 20.000 and Optimized settings is set and fixed with Apply changes. This initialized the computer for best network performance.

#### 4.4.7 Black site bandwidth test

The TCP and UDP network capacity is tested with JPerf. This will provide information in the peak and average capacity of the network.

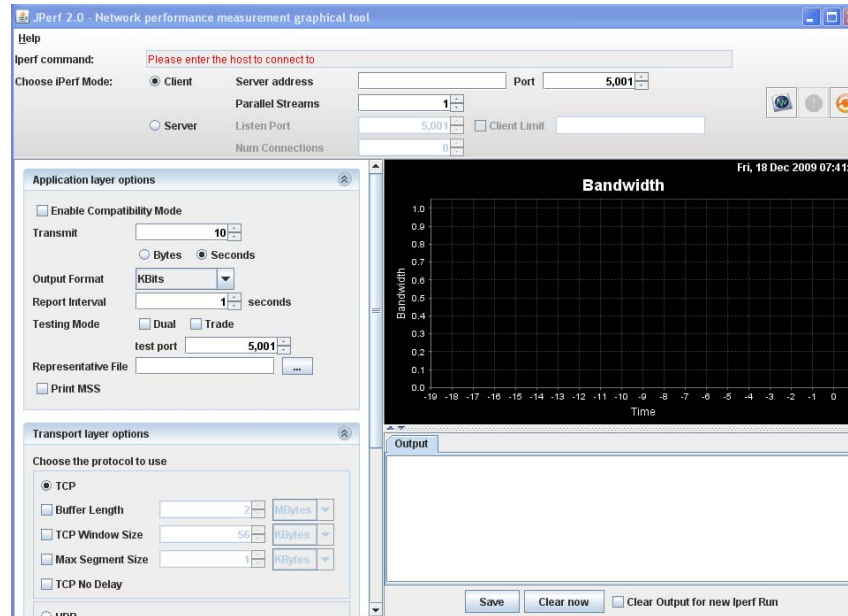


Figure 3 JPerf

#### 4.4.7.1 JPERF Client unclassified Configuration

Server address **t.b.d.**  
 Port 5001  
 Parallel streams 1

#### Application layer options

Transmit 10 seconds  
 Output Kbit/s  
 Report interval 1 second  
 Test port 5001



**Transport layer options**

**TCP**

Buffer length t.b.d.

TCP window size t.b.d.

Max segment size t.b.d.

TCP no delay (off)

**UDP**

UDP bandwidth t.b.d.

UDP buffer size t.b.d.

UDP packet size t.b.d.

**IP layer options**

TTL 1

Type of service None

Bind to host t.b.d.

IPv6 (off)

4.4.7.2 JPERF Server unclassified Configuration

Listen Port 5001

Client limit t.b.d.

Number of connections 1

**Application layer options**

Transmit 10 seconds

Output Kbit/s

Report interval 1 second

Test port 5001

**Transport layer options**

**TCP**

Buffer length t.b.d.

TCP window size t.b.d.

Max segment size t.b.d.

TCP no delay (off)

**UDP**

UDP bandwidth t.b.d.





UDP buffer size **t.b.d.**  
UDP packet size **t.b.d.**

**IP layer options**

TTL 1  
Type of service None  
Bind to host **t.b.d.**  
IPv6 (off)

**4.4.8 Red site bandwidth test**

The TCP and UDP network capacity is tested with JPerf. This will provide information in the peak and average capacity of the network.

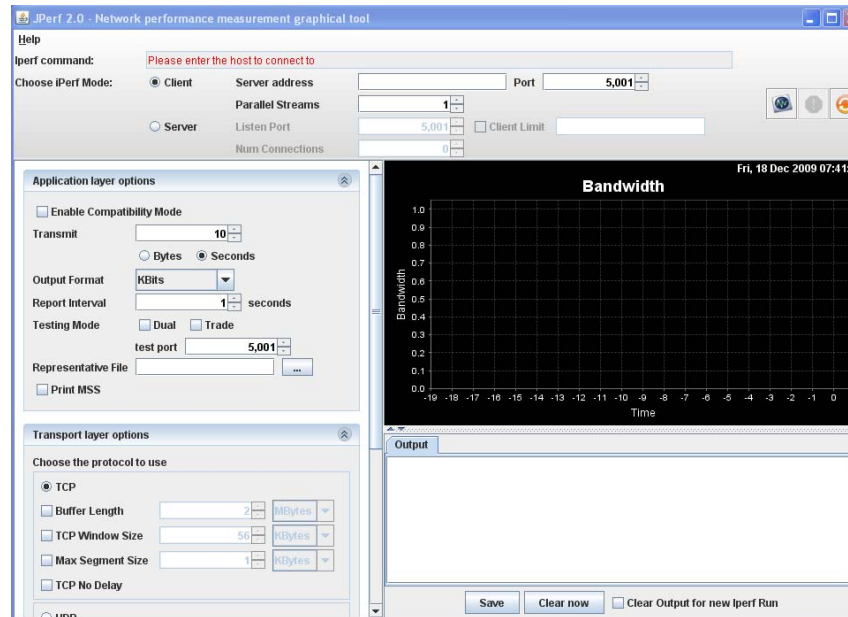


Figure 4 JPerf



#### 4.4.8.1 JPERF Client classified Configuration

Server address **t.b.d.**  
Port 5001  
Parallel streams1

##### Application layer options

Transmit 10 seconds  
Output Kbit/s  
Report interval 1 second  
Test port 5001

##### Transport layer options

###### **TCP**

Buffer length **t.b.d.**  
TCP window size **t.b.d.**  
Max segment size **t.b.d.**  
TCP no delay (off)

###### **UDP**

UDP bandwidth **t.b.d.**  
UDP buffer size **t.b.d.**  
UDP packet size **t.b.d.**

##### IP layer options

TTL 1  
Type of service None  
Bind to host **t.b.d.**  
IPv6 (off)

#### 4.4.8.2 JPERF Server classified Configuration

Listen Port 5001  
Client limit **t.b.d.**  
Number of connections 1



**Application layer options**

Transmit	10 seconds
Output	Kbit/s
Report interval	1 second
Test port	5001

**Transport layer options**

**TCP**

Buffer length	<b>t.b.d.</b>
TCP window size	<b>t.b.d.</b>
Max segment size	<b>t.b.d.</b>
TCP no delay	(off)

**UDP**

UDP bandwidth	<b>t.b.d.</b>
UDP buffer size	<b>t.b.d.</b>
UDP packet size	<b>t.b.d.</b>

**IP layer options**

TTL	1
Type of service	None
Bind to host	<b>t.b.d.</b>
IPv6	(off)

**4.5 Network monitoring during pre initiative test and initiative**

The network monitoring system consists of two centralized 19" servers. One server uses LINUX as operating system and the other server is using WINDOWS SERVER 2008 as operating system. These two servers monitor the network and provide all sites connect with the network status information on a web based interface.

**4.5.1 Network devices**

Network devices such as routers and switches need to provide access to the network tools. This means that Simple Network Management Protocol (SNMP) "READ" access is needed by the network management and monitoring tools.

**4.5.1.1 Router and switch configuration**

To provide read access for the network management and monitoring tools the following information should be added to CISCO network device configuration (example for TNO in The Hague):



```
!  
snmp-server community !NETN@CFBL#$$! RO  
snmp-server location NLD, TNO, The Hague  
snmp-server contact phone: +31651096151  
!
```

## 4.5.2 Server 1 LINUX

For information about the server hardware see Appendix E.1.

### 4.5.2.1 MRTG

MRTG is using the Simple Network Management Protocol (SNMP) to get information from network devices.

X  
X Diagram not available  
X

#### 4.5.2.1.1 MRTG Configuration

The MRTG configuration depends on the detailed implementation. Therefore it is not possible to describe that at this stage.

## 4.5.3 Server 2 Windows

For information about the server hardware see Appendix E.1.

### 4.5.3.1 WhatsUp Gold

WhatsUp Gold is network management software. PING and Simple Network Management Protocol (SNMP) protocols are used to test connectivity to devices and to request status information from these devices. The software provides delay information to all devices and if the devices are reachable by SNMP and is allowed to have access also bandwidth and error information for each port used on that device is available.



The tool also has a build in web-server. This makes it easy to access it with a standard web browser from different locations while it is on one site installed.

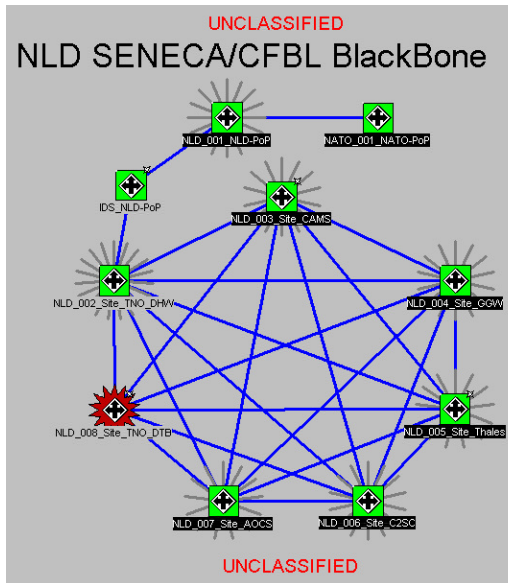


Figure 5 WhatsUp Gold Network example

#### 4.5.3.1.1 Whats Up gold Configuration

The WhatsUp configuration depends on the detailed implementation. Therefore it is not possible to describe that at this stage.

#### 4.5.3.2 MTRG

Multi Router Traffic Grapher (MTRG) is free software and available for windows and Linux. For live Traffic graphs of GEANT 2 network see: <http://www.switch.ch/network/operation/statistics/geant2.html>

MRTG shows live and history information about network devices (Used bandwidth, delay, errors). It is able to monitor all ports on all initiative switches and presents the results on a web server for easy user access on daily, weekly, monthly and yearly bases.

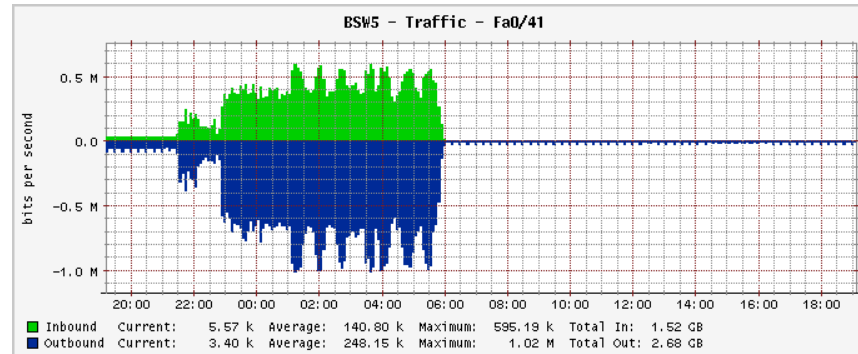


Figure 6 Network load NLD during CDEP initiative (NLD <->CFBL connection)

#### 4.5.3.2.1 MTRG Configuration

The MTRG configuration depends on the detailed implementation. Therefore it is not possible to describe that at this stage.

#### 4.5.3.3 Wireshark

Wireshark is a monitoring tool. The tool can look deep in the IP packet and show the interpretation of bits in the received packet header. This makes it possible to detect fragmentation, find problems in for instance multicast associations and so on. The problem is that it has to be installed on the site and remote management is not possible other than a remote desktop connection. Wireshark is a free tool.

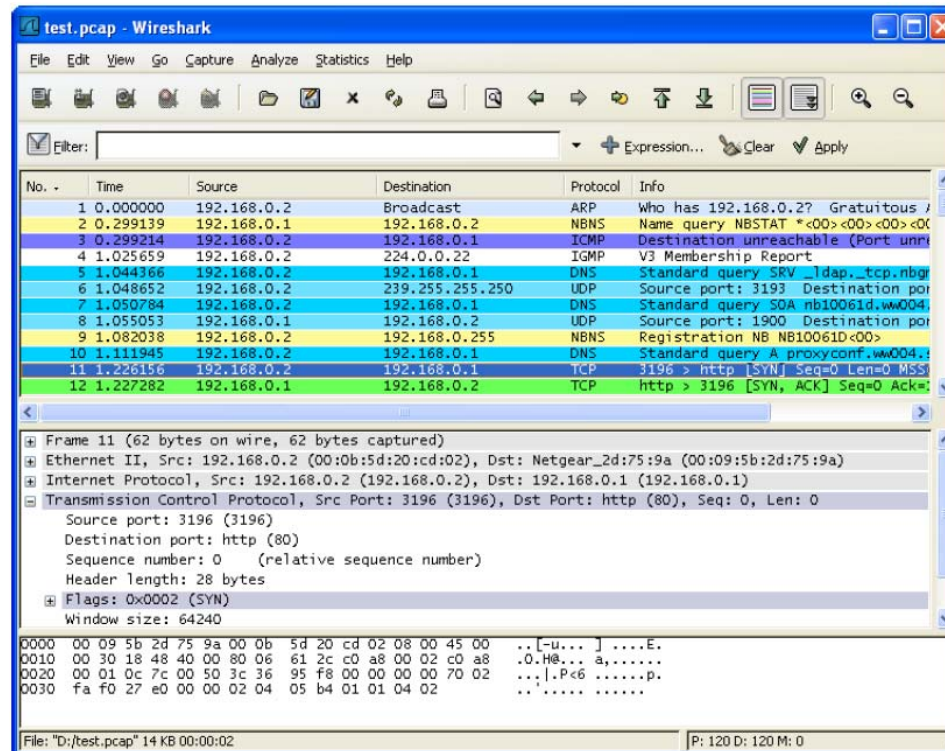


Figure 7 Wireshark window

#### 4.5.3.3.1 Wireshark Configuration

The Wireshark configuration depends on the detailed implementation. Therefore it is not possible to describe that at this stage.



## 5 Test Results and Conclusions from the NETN Experiment

### 5.1 Intro

The MSG-068 Infrastructure Subgroup developed the initial network topology design for the Experiments. The Infrastructure consisted of three variants:

- Unclassified Network Infrastructure using Internet
- Unclassified Network Infrastructure using CFBLNet over Internet backbone
- Unclassified Network Infrastructure using CFBLNet over NATO NGCS backbone

The latter two options are closely related and will be discussed together.

#### 5.1.1 Unclassified Network Infrastructure over Internet

The Internet was used during most of the preparation and testing for the Experiment. In order to simplify the network configuration of the assets (IP ranges, Firewall settings etc) a tool supplied by Sweden was used. This tool is named 'Booster'. It provides a type of Virtual Private Network for HLA related traffic. The sites install a local client and a central server node is available to monitor the network and node activity, participating federates and other information. The Booster server was located in Linköping Sweden during the preparation phase and in Bydgoszcz (Poland) during the experiment.



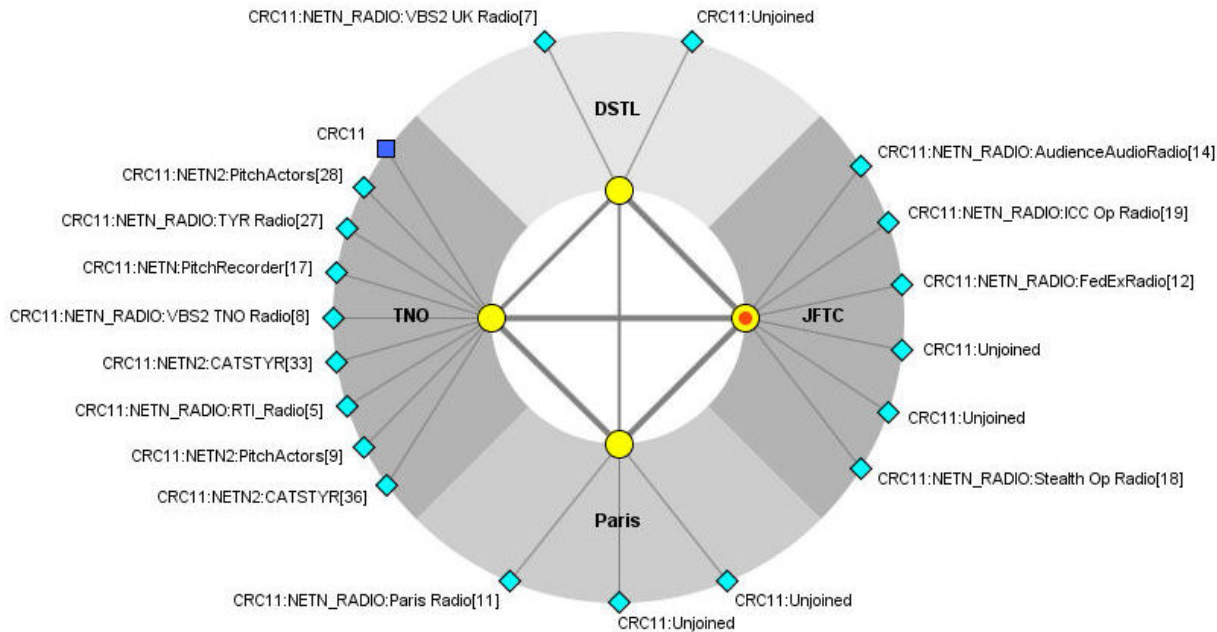
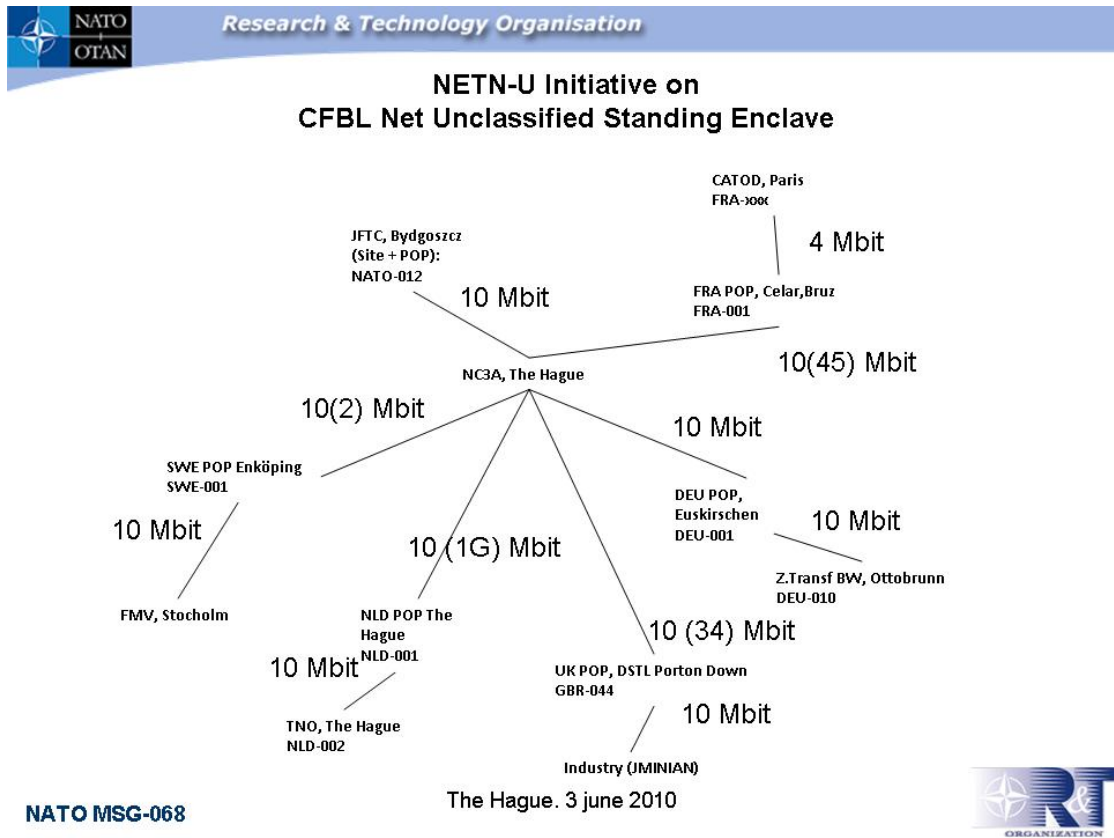


Figure 8 Booster Network Overview Diagram

### 5.1.2 Unclassified Network Infrastructure over CFBLNet

The MSG-068 Infrastructure Subgroup developed the initial network topology design for the Experiments. The Infrastructure was based on CFBLNet. Given the nature of the experiments (unclassified, technical feasibility demonstration) and the available resources, the decision was

taken to establish the NETN Infrastructure on an existing CFBLnet Unclass Enclave (CUE), also known as White Enclave ((future) Standing Class Enclave). The necessary paper work (CFBLNet Initiative Information Package CIIP) was produced in collaboration with the nations and the CFBLnet organization. The proposed topology with planned bandwidths is shown in the diagram below. Note that a permanent Infrastructure solution should establish a dedicated NETN Enclave under CFBLNet to simplify and streamline the process of setting up an exercise or experiment.



NATO MSG-068

Figure 9 CFBLNet Topology as planned for MSG-068 NETN Experiment



Due to resource and scheduling issues the final topology that was used in the NETN Experiment differed from the proposal in two ways:

- Site Ottobrunn in Germany could not be connected and thus The German team did not participate in the CFBLnet based Experiments.
- Site Stockholm in Sweden could not be connected and the Swedish team moved to The Hague, Netherlands to participate in the CFBLnet based Experiments.
- The UK used the site Porton Down and did not bring Industry sites on-line.

The Spanish team moved to CATOD, Paris during the Experiment as was planned during the design phase. Note that, according to plan, several other Team members used the site in Bydgoszcz to connect their assets.

The CFBLNet was implemented under supervision of the CFBLnet national Technical POCs. Unfortunately several sites came on-line only shortly before the Experiment started. This was due to resource issues as well as to accreditation issues that needed more time to sort out than what was expected. This resulted in very limited opportunity for testing federates running over CFBLnet before the actual Experiment started.

The NETN Infrastructure was largely based on an existing CFBLnet Unclass Enclave (CUE). The new 'legs' (e.g. The Hague-Bydgoszcz) were initially planned to run on an NGCS backbone. Due to performance concerns an alternative was also tested that used (encrypted) Internet backbones. This Internet-based setup provided good performance, although no Quality of Service could be guaranteed.

## **5.2 Pre initiative test**

In the pre initiative test information was collected based on available measured CFBLNet network parameters and based on specific Ping tests that provided connectivity and delay information. The tests were done on the unclassified side of the network (Appendix E.4). Testing opportunities were very limited due to late availability of the Infrastructure.

Setup wise there were two types of networks being used, namely ordinary Internet or CFBLNet. The CFBLNet type was also evaluated in two different flavors, standard CFBLNet over NGCS as well as CFBLNet over encrypted Internet. The ordinary Internet connection contained no encryption or other security measures beyond the booster encapsulation of data. Also, no traffic prioritization improvements were possible on the Internet connection. The CFBLNet over NGCS has QoS and Routing control since all traffic is routed through a separate internal network that is laid in parallel with the regular Internet connection. Due to ping/latency problems when using CFBLNet over NGCS between Bydgoszcz and The Hague a separate CFBLNet connection over encrypted Internet was tested. This encrypted Internet connection of course had the same shortcomings as the normal Internet connection since the same basic layer of connectivity was used.

## **5.3 Monitoring test**

In the monitoring test the following information of the classified network is important to find problems:

- Used Bandwidth for the protocols used
- Delay between all sites
- Reachable services
- Fragmentation

In the Hourly Throughput below (Figure 11) a trend can be seen in that Bandwidth usage increased steadily over the course of the experiment. This is mainly due to an increased number of participants and increased radio traffic between actors. The experiment was conducted with NGCS over encrypted Internet. This caused perceived problems in that the training audience experienced failures in radio communication, mostly in the form of breakups in transmissions. A note about this is that there is no prioritization being performed during any of the stages now, neither on the network layers nor in the booster overlay. Following to this experiment a new network traffic ordering and prioritizing transport scheme is tested in the booster. The main difference is that not any one federate is allowed to send for more than a short period of time, i.e. a round-robin pattern. Latency wise the connection was very good though, the problems perceived were of the bandwidth and prioritization nature.

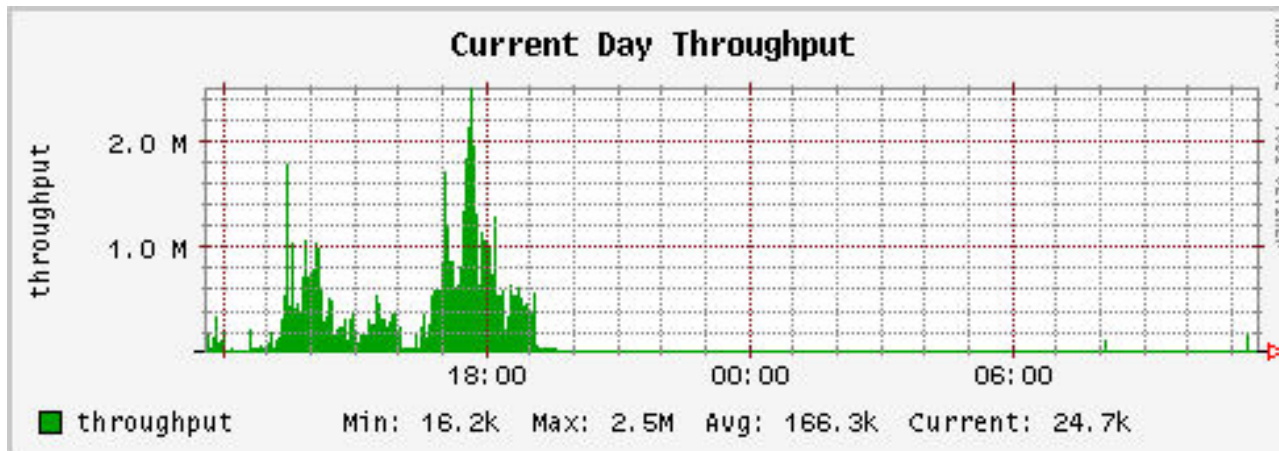


Figure 10 Daily Throughput (Afternoon 3 nov 2010 - Morning 4 nov 2010)

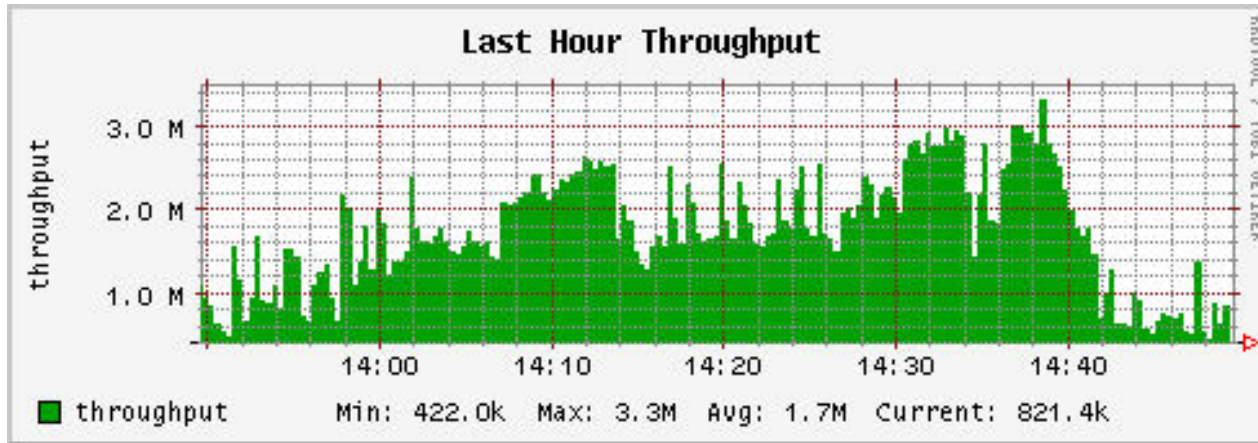
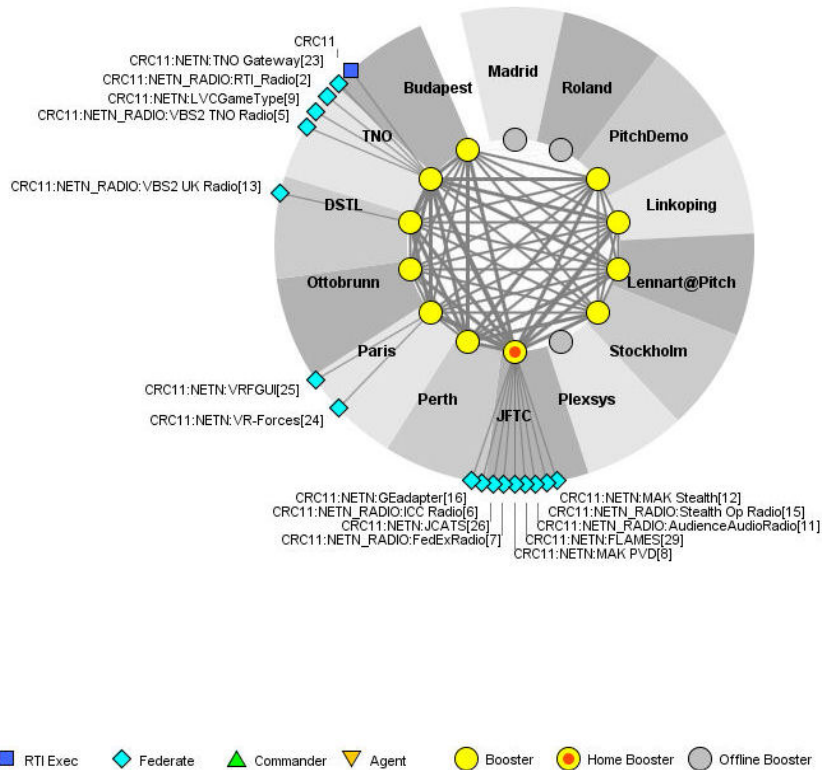


Figure 11 Hourly throughput during NLVC Experiment (Afternoon 4 nov 2010)

The Booster monitor visualizes the increased number of participants and connections during the experiment.



**Figure 12 Booster Network Overview Diagram (Internet Experimentation)**

On average the network bandwidth did not exceed 3 Mbit/s. However, this depends highly on the events (interactions) taking place during the exercise and in particular on the radio traffic which consumes much bandwidth. A problem remains that we (engineers) still don't have good way to specify what capabilities the network needs to have for a specific set of federates and a specific scenario. This includes



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estimating the data rates that result from typical manoeuvring that operational pilots execute during missions and the impact of radio/voice transmissions on the required bandwidth.

The MSG-068 experience with CFBLNet showed that this infrastructure shows promise but has not yet achieved a good grip on providing a guaranteed service level wrt bandwidth, latency etc.

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## 6 Referenced publications

1. CFBLNet-Pub1- Main-V6.0-U
2. CFBLNet-Pub1- Annex A-V6.0-U
3. CFBLNet-Pub1- Annex B-V6.0-U
4. CFBLNet-Pub1- Annex C-V6.0 Appendices-U
5. CFBLNet-Pub1- Annex C-V6.0-U
6. CFBLNet-Pub1- Annex D-V6.0 Appendices-UNRI
7. CFBLNet-Pub1- Annex D-V6.0-U
8. CFBLNet-Pub1- Annex E-V6.0
9. CFBLNet-Pub1- Annex F-V6.0
10. CFBLNet-Pub1- Annex G-V6.0-U
11. NATO STANAG 4603 – HLA
12. IEEE 1516 HLA
13. IEEE Std 1278.1a-1998  
IEEE Standard for Distributed Interactive Simulation – Application Protocols  
18 august 1998, New York
14. IEEE Std 1278.1-1995  
IEEE Standard for Distributed Interactive Simulation – Application Protocols
15. IST-CF-98-07  
Enumeration and Bit Encoded Values for Use with Protocols for Distributed Interactive Simulation Applications. This document accompanies IEEE Std. 1278.1-1995 and IEEE Std. 1278.1a-1998 June 20, 1998
16. MSG-068 NETN Network Infrastructure Design Document ([Annex D of this report](#))



## Appendix E.1 NETN SERVER Hardware

DELL™ PowerEdge™ R200 (SV4R200) € 730,00



Module	description
Base	Dual Core Intel® Xeon® E3120, 3.16GHz, 6MB Cache, 1333MHz FSB
Memory	4 GB Memory, DDR2, 800 MHz (2 x 2GB Dual Ranked DIMMs)
Optical drive stations	16 X DVD +/- RW Drive SATA
1 st hard drive	250 GB, SATA, 3.5-inch, 7.2K RPM Hard Drive (Cabled)
2 de hard drive	250 GB, SATA, 3.5-inch, 7.2K RPM Hard Drive (Cabled)
1 st RAID- or SCSI-controller card	SAS 6iR internal RAID Controller, PCI-Express
RAID-connectivity	C4 - Add-in SAS 6iR (SATA / SAS Controller) which supports 2 Hard Drives - RAID 1
Rails rack montage	Rack Rails Static Rapid
Extension card	Riser with PCI-E Support (1 x PCI-E x8 slot, 1x PCI-E x4 slot)
System management	Open Manage Software loaded and DVD Kit
Operating System	Not Included
Bezel	Power Edge R200 Bezel Assembly



## Appendix E.2 NETN Client Hardware

Module	description
Base	
Memory	
Optical drive stations	
1 st hard drive	
2 de hard drive	
1 st RAID- or SCSI-controller card	
RAID-connectivity	
Rails rack montage	
Extension card	
System management	
Operating System	
Bezel	



**Appendix E.3 NETN Infrastructure Test Tool Specifications**

Tool Description	Operating system	Version	Date	Vendor	Website	Approx. Costs	Remarks
WhatsUp Gold	windows					E 2000,-	
MRTG	LINUX	latest			MRTG	free	Multi Router Traffic Grapher (MTRG) is free software and available for windows and Linux.



**Appendix E.4 Measured Average Delay between National CFBLNet PoPs (January 2009)**

CFBLNet BlackBone

	AUS	CAN	DEU	FRA	GRB	ITA	NATO	NLD	NZL	USA	SWE	
AUS												
CAN												
DEU												
FRA												
GRB												
ITA												
NATO	390	170	24	25	30	140		1	450	135		
NLD	390	170	24	25	30	140	1		450	135		
NZL												
USA												
SWE												

All times are in milliseconds



NETN enclave (Data removed due to declassification)

	AUS	CAN	DEU	FRA	GRB	ITA	NATO	NLD	NZL	USA	SWE	
AUS												
CAN												
DEU												
FRA												
GRB												
ITA												
NATO												
NLD												
NZL												
USA												
SWE												

All times are in milliseconds



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# IITSEC 10 NETN Federation Agreements D1



## Background

This Federation Agreements Document (FAD) support the development and execution of a federated distributed simulation based on NATO Education and Training Network (NETN) Federation Architecture and FOM Design (FAFD) recommendations made by the NATO RTO Task Group MSG-068. The federation is intended to support a multi-national distributed advanced technical demonstration of MSG-068 results at the Interservice/Industry Training, Simulation and Education Conference (IITSEC) held in Orlando Florida, USA in December 2010.

## Strategic Theme

Presenting and demonstrating M&S support for NATO Future Joint Distributed Training and Exercises.

## Scope

Demonstrate the main results of MSG-068 task group.

## Objectives

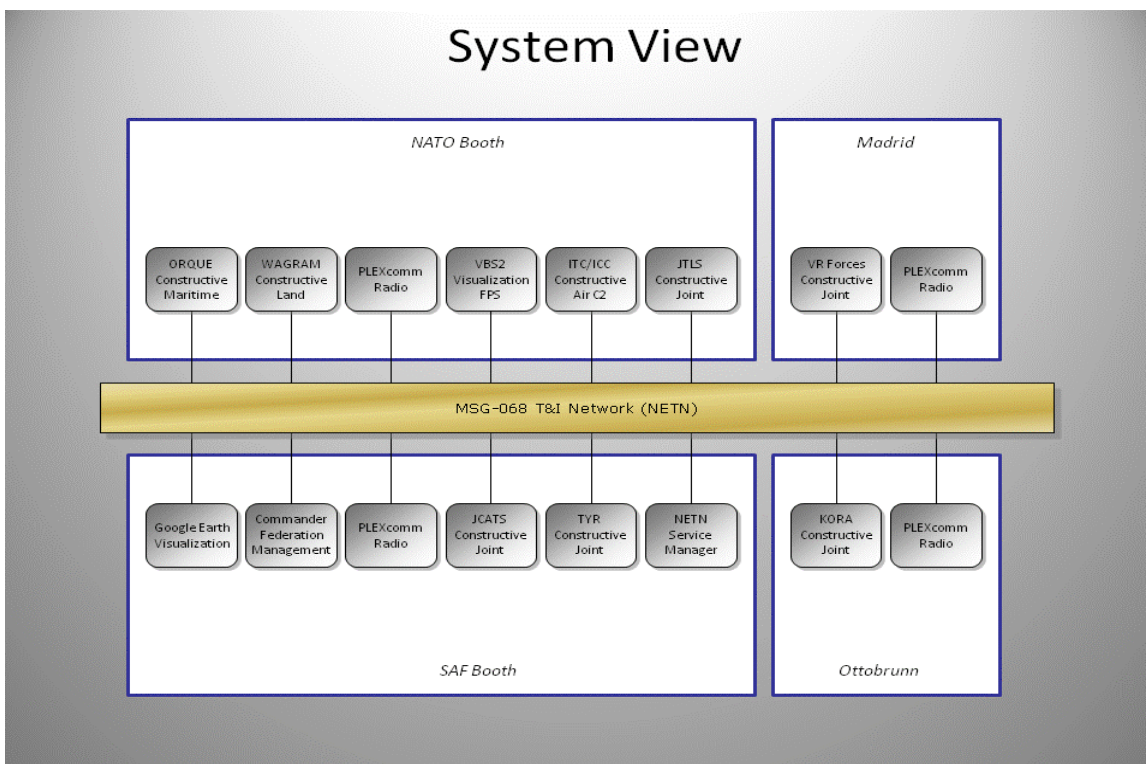
- Present MSG-068 objectives, activities, main results and recommendations
- Present NETN Federation Architecture and FOM Design
- Present NETN Infrastructure Recommendations
- Demonstrate (technical demo) a distributed NETN federation with NATO and partner national systems

## Systems

Name	Description	Purpose
AV System	Audio and Video	Audio and Video Control
Commander	Federation management	Federation Monitoring and Control
Google Earth	Scenario Viewer	Situation awareness picture: SITFOR, Police and civilian. EXCON / AAR Online
ICC	Constructive Air Simulation and ICC stimulation	Recognized Air Picture (RAP)
JCATS	Constructive Joint Simulation	Joint Land Simulation
JTLS	Constructive Joint Simulation	Joint Simulation

KORA	Constructive Joint Simulation	Joint Simulation
ORQUE	Constructive Maritime Simulation	Maritime Simulation and Air Refueling
PLEXcomm	Radio Simulation	Tactical and Admin Radio
Simulation Infrastructure	Distributed Simulation Runtime Infrastructure	Simulation Interoperability
TYR	Aggregate Level Constructive Simulation	Joint Simulation. EXCON / AAR Online
VBS2	First Person Virtual Simulation	Lower tactical and UAV simulation. Virtual situation awareness: Land, Air och Media
VR-Forces	Constructive Simulation	Joint Simulation
WAGRAM	Constructive Joint Simulation	Joint Simulation

## System Overview



## Other Supporting Software

Tools to support test, integration and execution of the federation.

Full Name	Version	Description
Pitch Actors	MSG-068	CGF
Pitch Booster	1.2	Private Simulation Network Overlay
Pitch NETN Service Manager	MSG-068	Test tool for NETN Consumer-Provider Patterns
Pitch Recorder	1.5	Simulation Traffic Record, Analysis and Playback
Pitch Visual OMT 1516	2.0	HLA Object Model Development Tool
Pitch pRTI 1516	4.2	HLA RTI

The following tools are provided by SWE to all participants to support development, test, integration and execution of the federation.

- Pitch pRTI
- Pitch Booster
- Pitch Visual OMT
- Pitch Recorder
- Pitch Commander

Instructions for obtaining the software is provided by FMV

## Scenario

Scenarios will be a subset of the MSG-068 Experimentation Vignettes.

### Vignettes for main presentation (not all every presentation)

Incident	Systems	Demo
UAV Recce	VBS2-UK, JCATS	RPR and NETN classes
Cruise Missile	Orque, JCATS, VBS2-UK	RPR, and NETN object classes, Detonation Effects
Airstrike	JCATS, JPECT, VBS2-UK, VBS2-NLD	RPR, and NETN object classes, Detonation Effects
Ground Strike with CCA	WAGRAM, JCATS, VR-Forces, VBS2-UK, TYR	RPR and NETN classes, direct and indirect fire
Marine Blocking Position	JCATS, VBS2-UK	RPR and NETN classes, indirect/direct fire and detonation

### Additional vignettes prepared for demo between scheduled events

Incident	Systems	Demo
Sealift	Orque, WAGRAM, VR-Forces, JTLS	Convoy Logistics Pattern
Air Refuel	ORQUE , JTLS, TYR	Supply Logistics pattern
Hostage Evac	KORA, TYR	Convoy logistics pattern
MEDEVAC	KORA, VR-Forces	Convoy logistics pattern

## Federation

### Simulation Infrastructure

The federation Runtime Infrastructure is based on the IEEE 1516-2010 (HLA Evolved) standard service API for distributed simulation. Systems using older HLA standards can connect using provided adapters.

Simulation Interface	Infrastructure
HLA IEEE 1516-2010	pRTI 1516 v4.2
HLA IEEE 1516-2000	pRTI 1516 v4.2 and 1516-2000 Adapter
HLA 1.3	pRTI 1516 v4.2 and HLA 1.3 Adapter

### RTI and Federation Settings

<b>Federation Name</b>	NETN
<b>CRC Name</b>	IITSEC_CRC

### NETN Federates

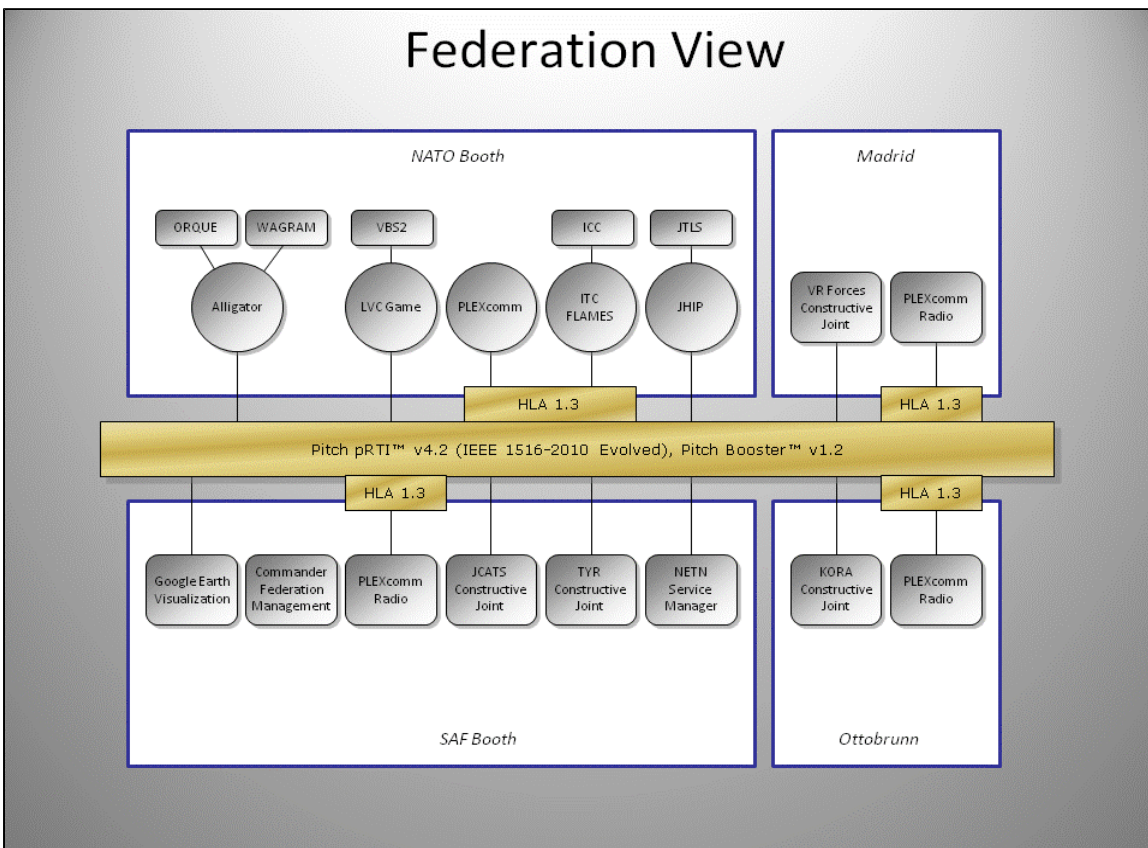
Full Name	Federate Name	Federate Type	HLA Interface	Federate Instances
ALLIGATOR	ORQUE&WAGRAM	ALLIGATOR	IEEE 1516-2010	1
Pitch Commander Agent	Commander	Commander Agent	IEEE 1516-2010	1
ITC Flames	ITC Flames	ITC Flames	HLA 1.3	1
JCATS Server	JCATS	JLVC	IEEE 1516-2010	1
JTLS Server	JTLS	JTLS	IEEE 1516-2010	1

KORA	KORA	KORA	IEEE 1516-2010	1
LVC Game	VBS2	LVC Game	IEEE 1516-2010	1
PLEXcomm	PLEXcomm	PLEXcomm	HLA 1.3	10
Pitch GE Adapter	Google Earth	GE Adapter	IEEE 1516-2010	1
CATS TYR Client	TYR Client	TYR Client	IEEE 1516-2010	1
CATS TYR Server	TYR Server	TYR Server	IEEE 1516-2010	1
VR-Forces	VR-Forces	VR-Forces	IEEE 1516-2010	1

For test and integration the following federates will also join the federation.

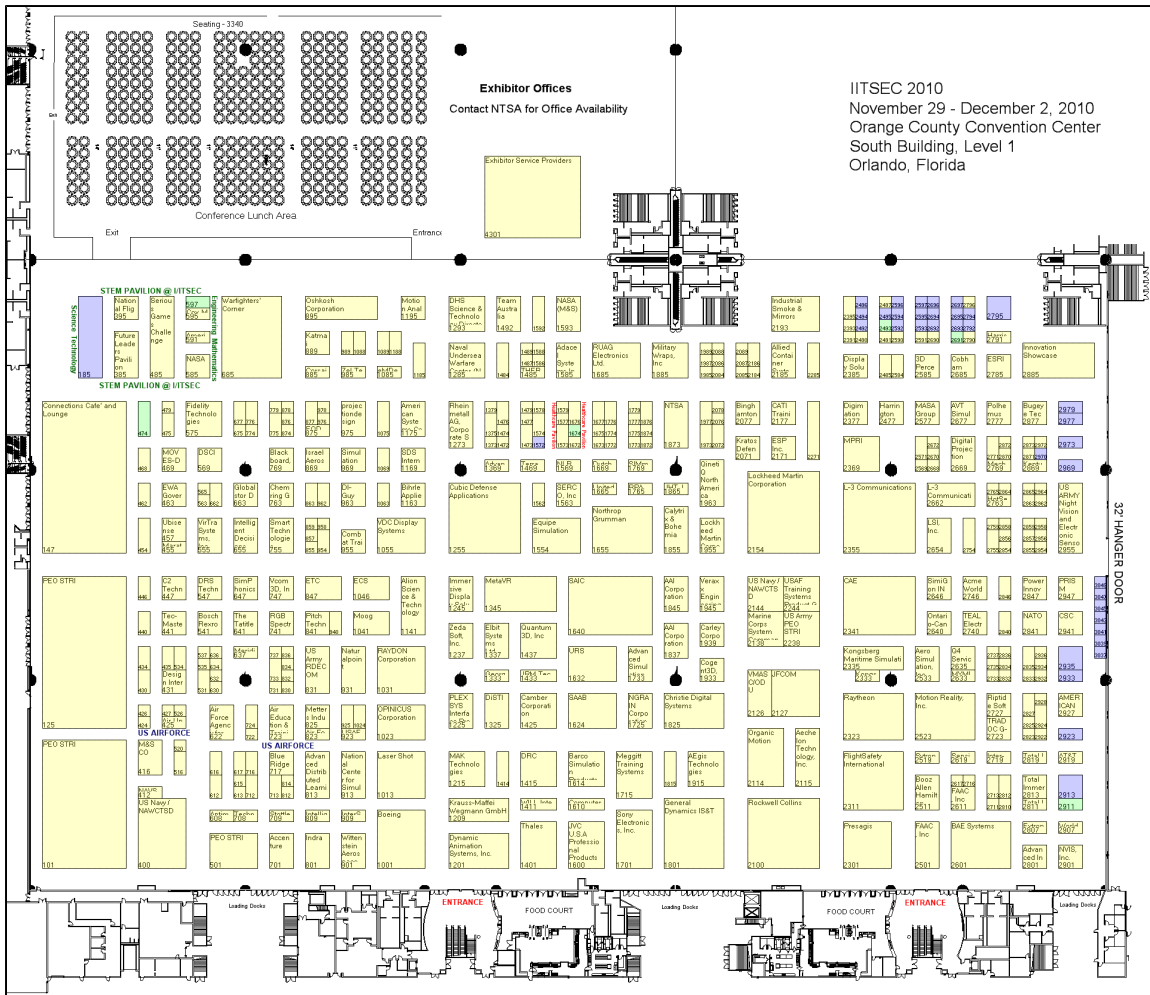
Full Name	Federate Name	Federate Type	HLA Interface	Federate Instances
Pitch Actors	Actors	Actors	IEEE 1516-2010	1
Pitch NETN Service Manager	Service Manager	NETN Service Manager	IEEE 1516-2010	1
Pitch Recorder	Pitch Recorder	Recorder	IEEE 1516-2010	1

## Lollipop

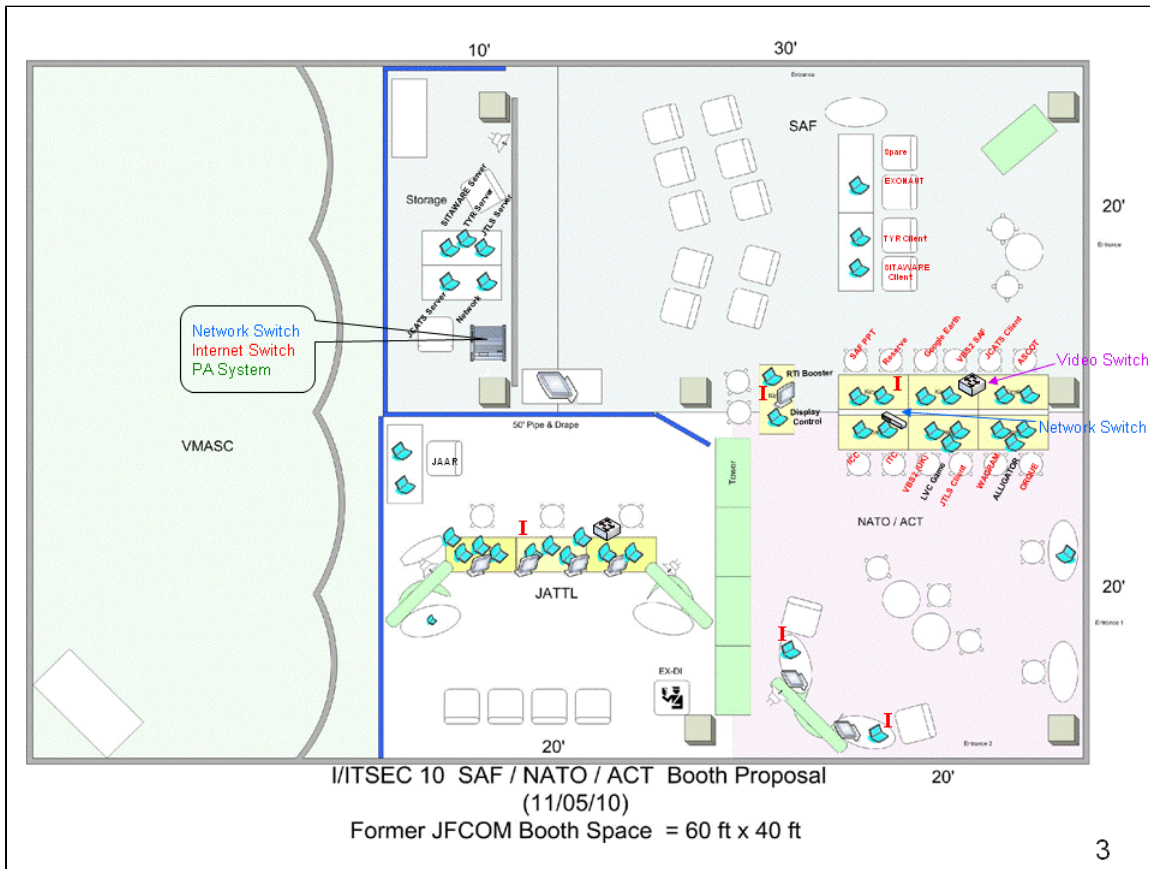


## Booth Layout

### Show Floorplan



**Detailed Booth Layout**



## Network

Name	IP
Display Control Laptop	192.168.10.07
Google Earth Laptop	192.168.10.11
RTI and Booster Laptop	192.168.10.12 + Public IP
TYR Server Laptop	192.168.10.13
TYR Client Laptop	192.168.10.14
JCATS Server Laptop	192.168.10.15
JCATS Client Laptop	192.168.10.16
ITC Laptop	192.168.10.17
ICC Laptop	192.168.10.18
ORQUE Laptop	192.168.10.19
WAGRAM Laptop	192.168.10.20
ALLIGATOR Laptop	192.168.10.21
JTLS Client Laptop	192.168.10.22
JTLS Server Laptop	192.168.10.23
VBS2 UK Laptop	192.168.10.24
LVC Game Laptop	192.168.10.25

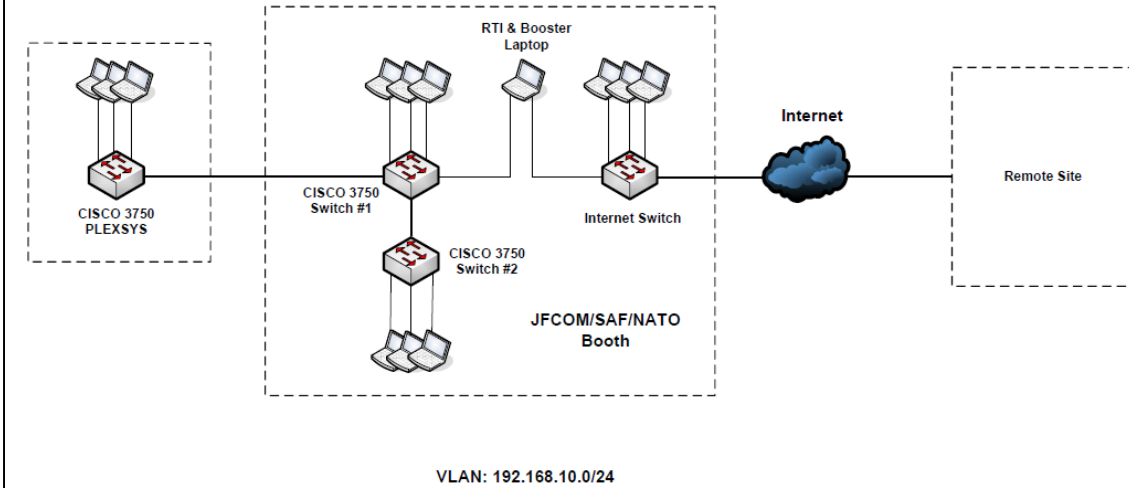
Booster "IITSEC" running on 192.168.10.12

192.168.10.3-10 Reserved for SAF Demonstration

## Remote Sites and Systems

Site	Booster	Systems
IABG, Ottobrunn, DEU	84.11.17.135:8686	KORA
MoD, Madrid, ESP	88.30.61.95:8686	VR-Forces
JFTC, Bydgoszcz, POL	81.15.244.88:8686	
Artifex, Budapest, HUN	81.183.210.28:8686	
TNO, The Hague,NLD	195.169.128.61:8686	
NC3A, The Hague,NLD	195.169.118.98:8686	
FMV, Stockholm, SWE	192.165.65.207:8686	
Pitch, Linkoping, SWE	80.252.168.222:8686	
DGA, Paris, FRA	194.254.107.30:8687	
R&A, Monterey, CA	216.228.3.210:8686	
PLEXSYS, Camas,WA	173.164.66.89:8688	
Calytrix, Perth, AUS	116.212.205.222:8686	
IITSEC10, Orlando, FL	TBD	TYR, JCATS, VBS2, JTLS, ORQUE, WAGRAM, ITC/ICC

**I/ITSEC2010  
Network Diagram  
10/18/2010**



## Audio and Video

### Video

- 16x16 Video Switch Provided by JFCOM

Name	Video Switch Input #	Video Output #
JCATS Client Laptop	2	
Google Earth Laptop	7	
TYR Client Laptop	8	
ICC Laptop	9	
ITC Laptop	10	
VBS2 UK Laptop	12	
JTLS Client Laptop	13	
WAGRAM Laptop	14	
ORQUE Laptop	16	
External Monitor NATO Center		1
External Monitor NATO Left		2
External Monitor NATO Right		3
External Monitor FedExCtrl		5
Display Control Laptop		
16x16 Video Switch		

Input 10-16 reserved for NATO MSG-068 Demonstration Systems.

Output 10-16 reserved for NATO MSG-068 Demonstration Systems

## Audio

- PA System provided by JFCOM

 PLEXcomm audio out  External Speakers

## Operators

### System Operators and Technical POC

Name	Operator	Technical POC
AV System	Per-Philip Sollin	Jim Janele
Commander	Björn Lövstrand	Per-Philip Sollin
Google Earth	Björn Lövstrand	Björn Lövstrand
ICC	Clive Wood	Clive Wood
JCATS	Thierry Grom	Thierry Grom
JTLS		
KORA		Michael Wolf-Bolle
ORQUE		
PLEXcomm	All Operators	Jamie Boulet
Simulation Infrastructure		Per-Philip Sollin
TYR	Max Karlström	Max Karlström
VBS2	Caroline Pettitt-Morris	Caroline Pettitt-Morris
VR-Forces	Patricio Jimenez	Patricio Jimenez
WAGRAM		

## Appendix

### Appendix 1 - Systems

Name	Full Name	Version	Commercial POC	Technical POC	Operator	Description	Purpose
AV System	AV System		Jim Janele	Jim Janele	Per-Philip Sollin	Audio and Video	Audio and Video Control
Commander	Pitch Commander	2.2.0	Björn Lövstrand	Per-Philip Sollin	Björn Lövstrand	Federation management	Federation Monitoring and Control
Google Earth	Google Earth PRO	5.2.1.1588	Björn Lövstrand	Björn Lövstrand	Björn Lövstrand	Scenario Viewer	Situation awareness picture: SITFOR, Police and civilian. EXCON / AAR Online
ICC	ICC			Clive Wood	Clive Wood	Constructive Air Simulation and ICC stimulation	Recognized Air Picture (RAP)
JCATS	JCATS Server		Amy Grom	Thierry Grom	Thierry Grom	Constructive Joint Simulation	Joint Land Simulation
JTLS	JTLS Server					Constructive Joint Simulation	Joint Simulation
KORA	KORA		Karl-Heinz Neumann	Michael Wolf-Bolle		Constructive Joint Simulation	Joint Simulation



ORQUE	ORQUE		Jose Ruiz			Constructive Maritime Simulation	Maritime Simulation and Air Refueling
PLEXcomm	PLEXcomm	3.0		Jamie Boulet	All Operators	Radio Simulation	Tactical and Admin Radio
Simulation Infrastructure	Simulation Infrastructure		Björn Löfstrand	Per-Philip Sollin		Distributed Simulation Runtime Infrastructure	Simulation Interoperability
TYR	CATS TYR Server	3.2	Torsten Bernström	Max Karlström	Max Karlström	Aggregate Level Constructive Simulation	Joint Simulation. EXCON / AAR Online
VBS2	Virtual Battlespace 2		Caroline Pettitt-Morris	Caroline Pettitt-Morris	Caroline Pettitt-Morris	First Person Virtual Simulation	Lower tactical and UAV simulation. Virtual situation awareness: Land, Air och Media
VR-Forces	VR-Forces		Patricio Jimenez	Patricio Jimenez	Patricio Jimenez	Constructive Simulation	Joint Simulation
WAGRAM	WAGRAM		Jose Ruiz			Constructive Joint Simulation	Joint Simulation

## AV System

<b>Name</b>	AV System
<b>Full Name</b>	AV System
<b>Commercial POC</b>	Jim Janele
<b>Technical POC</b>	Jim Janele
<b>Operator</b>	Per-Philip Sollin
<b>Description</b>	Audio and Video
<b>Purpose</b>	Audio and Video Control

## AV Hardware

Name	Owner	Tech POC	Location
JTLS Client Laptop	JWC	Andy Brown	NATO Booth
ORQUE Laptop	DGA	Jose Ruiz	NATO Booth
External Monitor NATO Right	JFCOM	Jim Janele	NATO Booth
Display Control Laptop	Pitch	Per-Philip Sollin	SAF Booth
Google Earth Laptop	FMV	Björn Löfstrand	SAF Booth
ICC Laptop	NC3A	Clive Wood	NATO Booth
JCATS Client Laptop	JFCOM	Thierry Grom	SAF Booth
TYR Client Laptop	FMV	Max Karlström	SAF Booth
WAGRAM Laptop	DGA	Jose Ruiz	NATO Booth
ITC Laptop	NC3A	Clive Wood	NATO Booth
External Monitor NATO Center	JFCOM	Jim Janele	NATO Booth
External Monitor NATO Left	JFCOM	Jim Janele	NATO Booth
External Monitor FedExCtrl	JFCOM	Jim Janele	SAF Booth
VBS2 UK Laptop	DSTL	Caroline Pettitt-Morris	NATO Booth
16x16 Video Switch	JFCOM	Jim Janele	SAF Storage

## Software

Full Name	Version	Description
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## Commander

<b>Name</b>	Commander
<b>Full Name</b>	Pitch Commander
<b>Version</b>	2.2.0
<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Per-Philip Sollin
<b>Operator</b>	Björn Lövstrand
<b>Description</b>	Federation management
<b>Purpose</b>	Federation Monitoring and Control

### Hardware

Name	Owner	Tech POC	Location
Google Earth Laptop	FMV	Björn Lövstrand	SAF Booth

### Software

Full Name	Version	Description
Pitch Commander	2.2.0	Federation management
Pitch Commander Agent	2.2.0	Agent for monitoring and control

## Google Earth

<b>Name</b>	Google Earth
<b>Full Name</b>	Google Earth PRO
<b>Version</b>	5.2.1.1588
<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Björn Lövstrand
<b>Operator</b>	Björn Lövstrand
<b>Description</b>	Scenario Viewer
<b>Purpose</b>	Situation awareness picture: SITFOR, Police and civilian. EXCON / AAR Online

### Hardware

Name	Owner	Tech POC	Location
Google Earth Laptop	FMV	Björn Lövstrand	SAF Booth

### Software

Full Name	Version	Description
Google Earth PRO	5.2.1.1588	Scenario Viewer
Pitch GE Adapter	1.4	Google Earth Adapter for HLA

## ICC

<b>Name</b>	ICC
<b>Full Name</b>	ICC
<b>Version</b>	
<b>Description</b>	Constructive Air Simulation and ICC stimulation

### Federation

<b>Purpose</b>	Recognized Air Picture (RAP)
<b>Commercial POC</b>	
<b>Technical POC</b>	Clive Wood
<b>Operator</b>	Clive Wood

### Hardware

Name	Owner	Tech POC	Location
ICC Laptop	NC3A	Clive Wood	NATO Booth
ITC Laptop	NC3A	Clive Wood	NATO Booth

### Software

Full Name	Version	Description
ICC		Constructive Air Simulation and ICC stimulation
ITC Flames		Constructive Air Simulation and ICC stimulation

## Integration Support

<b>Name</b>	Integration Support
<b>Full Name</b>	Integration Support
<b>Version</b>	
<b>Commercial POC</b>	
<b>Technical POC</b>	Lennart Olsson
<b>Operator</b>	
<b>Description</b>	Supporting tools for test and integration
<b>Purpose</b>	Integration Support

### Hardware

Name	Owner	Tech POC	Location
RTI and Booster Laptop	FMV	Lennart Olsson	SAF Booth

### Software

Full Name	Version	Description
Pitch Actors	MSG-068	CGF
Pitch NETN Service Manager	MSG-068	Test tool for NETN Consumer-Provider Patterns
Pitch Recorder	1.5	Simulation Traffic Record, Analysis and Playback
Pitch Visual OMT 1516	2.0	HLA Object Model Development Tool

## JCATS

<b>Name</b>	JCATS
<b>Full Name</b>	JCATS Server
<b>Version</b>	
<b>Commercial POC</b>	Amy Grom
<b>Technical POC</b>	Thierry Grom
<b>Operator</b>	Thierry Grom
<b>Description</b>	Constructive Joint Simulation
<b>Purpose</b>	Joint Land Simulation

### Federation

<b>Federate Name</b>	JCATS
<b>Federate Type</b>	JLVC
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

### Hardware

<b>Name</b>	<b>Owner</b>	<b>Tech POC</b>	<b>Location</b>
JCATS Client Laptop	JFCOM	Thierry Grom	SAF Booth
JCATS Server Laptop	JFCOM	Thierry Grom	SAF Storage

### Software

<b>Full Name</b>	<b>Version</b>	<b>Description</b>
JCATS Server		Constructive Joint Simulation
JCATS Client		JCATS Client

## JTLS

<b>Name</b>	JTLS
<b>Full Name</b>	JTLS Server
<b>Version</b>	
<b>Commercial POC</b>	
<b>Technical POC</b>	
<b>Operator</b>	
<b>Description</b>	Constructive Joint Simulation
<b>Purpose</b>	Joint Simulation

### Federation

<b>Federate Name</b>	JTLS
<b>Federate Type</b>	JTLS
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

### Hardware

Name	Owner	Tech POC	Location
JTLS Client Laptop	JWC	Andy Brown	NATO Booth
JTLS Server Laptop	JWC	Andy Brown	SAF Storage

## Software

Full Name	Version	Description
JTLS Server		Constructive Joint Simulation
JTLS Client		JTLS Client

## KORA

<b>Name</b>	KORA
<b>Full Name</b>	KORA
<b>Version</b>	
<b>Commercial POC</b>	Karl-Heinz Neumann
<b>Technical POC</b>	Michael Wolf-Bolle
<b>Operator</b>	
<b>Description</b>	Constructive Joint Simulation
<b>Purpose</b>	Joint Simulation

## Federation

<b>Federate Name</b>	KORA
<b>Federate Type</b>	KORA
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## Hardware

Remote Site

<b>System</b>	KORA
<b>Owner</b>	IABG
<b>Location</b>	Ottobrunn Site
<b>IP</b>	Remote Site
<b>Tech POC</b>	Karl-Heinz Neumann
<b>Video Switch Input #</b>	
<b>Video Out Resolution</b>	

## ORQUE

<b>Name</b>	ORQUE
<b>Full Name</b>	ORQUE
<b>Version</b>	
<b>Commercial POC</b>	Jose Ruiz
<b>Technical POC</b>	
<b>Operator</b>	

<b>Description</b>	Constructive Maritime Simulation
<b>Purpose</b>	Maritime Simulation and Air Refueling

### Hardware

Name	Owner	Tech POC	Location
ORQUE Laptop	DGA	Jose Ruiz	NATO Booth
ALLIGATOR Laptop	DGA	Jose Ruiz	NATO Booth

### Software

Full Name	Version	Description
ORQUE		Constructive Maritime Simulation
ALLIGATOR		ORQUE and WAGRAM bridge to NETN

### PLEXcomm

<b>Name</b>	PLEXcomm
<b>Full Name</b>	PLEXcomm
<b>Version</b>	3.0
<b>Commercial POC</b>	
<b>Technical POC</b>	Jamie Boulet
<b>Operator</b>	All Operators
<b>Description</b>	Radio Simulation
<b>Purpose</b>	Tactical and Admin Radio

### Federation

<b>Federate Name</b>	PLEXcomm
<b>Federate Type</b>	PLEXcomm
<b>HLA Interface</b>	HLA 1.3
<b>Federate Instances</b>	10

### Hardware

Name	Owner	Tech POC	Location
JTLS Client Laptop	JWC	Andy Brown	NATO Booth
LVC Game Laptop	DSTL	Caroline Pettitt-Morris	NATO Booth
Display Control Laptop	Pitch	Per-Philip Sollin	SAF Booth
Google Earth Laptop	FMV	Björn Löfstrand	SAF Booth
JCATS Client Laptop	JFCOM	Thierry Grom	SAF Booth
RTI and Booster Laptop	FMV	Lennart Olsson	SAF Booth
TYR Client Laptop	FMV	Max Karlström	SAF Booth
ITC Laptop	NC3A	Clive Wood	NATO Booth
KORA	IABG	Karl-Heinz Neumann	Ottobrunn Site
VR-Forces	ESP MoD	Patricio Jimenez	Madrid Site

### Software

Full Name	Version	Description
PLEXcomm	3.0	Radio Simulation

## Simulation Infrastructure

<b>Name</b>	Simulation Infrastructure
<b>Full Name</b>	Simulation Infrastructure
<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Per-Philip Sollin
<b>Description</b>	Distributed Simulation Runtime Infrastructure
<b>Purpose</b>	Simulation Interoperability

### Hardware

Name	Owner	Tech POC	Location
RTI and Booster Laptop	FMV	Lennart Olsson	SAF Booth

### Software

Full Name	Version	Description
Pitch Booster	1.2	Private Simulation Network Overlay
Pitch pRTI 1516	4.2	HLA RTI

## TYR

<b>Name</b>	TYR
<b>Full Name</b>	CATS TYR Server
<b>Version</b>	3.2
<b>Commercial POC</b>	Torsten Bernström
<b>Technical POC</b>	Max Karlström
<b>Operator</b>	Max Karlström
<b>Description</b>	Aggregate Level Constructive Simulation
<b>Purpose</b>	Joint Simulation. EXCON / AAR Online

### Federation

<b>Federate Name</b>	TYR Server
<b>Federate Type</b>	TYR Server
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

### Hardware

Name	Owner	Tech POC	Location
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### Software

Full Name	Version	Description
CATS TYR Server	3.2	Aggregate Level Constructive Simulation

CATS TYR Client	3.2	TYR Client Federate
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## WAGRAM

<b>Name</b>	WAGRAM
<b>Full Name</b>	WAGRAM
<b>Version</b>	
<b>Commercial POC</b>	Jose Ruiz
<b>Technical POC</b>	
<b>Operator</b>	
<b>Description</b>	Constructive Joint Simulation
<b>Purpose</b>	Joint Simulation

### Hardware

Name	Owner	Tech POC	Location
ALLIGATOR Laptop	DGA	Jose Ruiz	NATO Booth
WAGRAM Laptop	DGA	Jose Ruiz	NATO Booth

### Software

Full Name	Version	Description
WAGRAM		Constructive Joint Simulation
ALLIGATOR		ORQUE and WAGRAM bridge to NETN

## VBS2

<b>Name</b>	VBS2
<b>Full Name</b>	Virtual Battlespace 2
<b>Version</b>	
<b>Commercial POC</b>	Caroline Pettitt-Morris
<b>Technical POC</b>	Caroline Pettitt-Morris
<b>Operator</b>	Caroline Pettitt-Morris
<b>Description</b>	First Person Virtual Simulation
<b>Purpose</b>	Lower tactical and UAV simulation. Virtual situation awareness: Land, Air och Media

### Hardware

Name	Owner	Tech POC	Location
LVC Game Laptop	DSTL	Caroline Pettitt-Morris	NATO Booth
VBS2 UK Laptop	DSTL	Caroline Pettitt-Morris	NATO Booth

### Software

Full Name	Version	Description
LVC Game	3.1.921.27503	VBS2 Bridge to HLA
Virtual Battlespace 2		First Person Virtual Simulation



## VR-Forces

<b>Name</b>	VR-Forces
<b>Full Name</b>	VR-Forces
<b>Version</b>	
<b>Commercial POC</b>	Patricio Jimenez
<b>Technical POC</b>	Patricio Jimenez
<b>Operator</b>	Patricio Jimenez
<b>Description</b>	Constructive Simulation
<b>Purpose</b>	Joint Simulation

## Federation

<b>Federate Name</b>	VR-Forces
<b>Federate Type</b>	VR-Forces
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## Hardware

Remote Site

<b>System</b>	VR-Forces
<b>Owner</b>	ESP MoD
<b>Location</b>	Madrid Site
<b>IP</b>	Remote Site
<b>Tech POC</b>	Patricio Jimenez
<b>Video Switch Input #</b>	
<b>Video Out Resolution</b>	

## Appendix 2 - Supporting Software

Name	Full Name	Version	System	Description
ALLIGATOR	ALLIGATOR		ORQUE, WAGRAM	ORQUE and WAGRAM bridge to NETN
Actors	Pitch Actors	MSG-068	Integration Support	CGF
Booster	Pitch Booster	1.2	Simulation Infrastructure	Private Simulation Network Overlay
Commander Agent	Pitch Commander Agent	2.2.0	Commander	Agent for monitoring and control
ITC	ITC Flames		ICC	Constructive Air Simulation and ICC stimulation
JCATS Client	JCATS Client		JCATS	JCATS Client
JTLS Client	JTLS Client		JTLS	JTLS Client
LVC Game	LVC Game	3.1.921.27503	VBS2	VBS2 Bridge to HLA
NETN Service Manager	Pitch NETN Service Manager	MSG-068	Integration Support	Test tool for NETN Consumer-Provider Patterns
Pitch GE Adapter	Pitch GE Adapter	1.4	Google Earth	Google Earth Adapter for HLA
Recorder	Pitch Recorder	1.5	Integration Support	Simulation Traffic Record, Analysis and Playback

TYR Client	CATS TYR Client	3.2	TYR	TYR Client Federate
Visual OMT	Pitch Visual OMT 1516	2.0	Integration Support	HLA Object Model Development Tool
pRTI 1516	Pitch pRTI 1516	4.2	Simulation Infrastructure	HLA RTI

## Actors

<b>Name</b>	Actors
<b>System</b>	Integration Support
<b>Full Name</b>	Pitch Actors
<b>Version</b>	MSG-068
<b>Commercial POC</b>	
<b>Technical POC</b>	Lennart Olsson
<b>Operator</b>	Lennart Olsson
<b>Description</b>	CGF

## Federation

<b>Federate Name</b>	Actors
<b>Federate Type</b>	Actors
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## ALLIGATOR

<b>Name</b>	ALLIGATOR
<b>System</b>	ORQUE, WAGRAM
<b>Full Name</b>	ALLIGATOR
<b>Version</b>	
<b>Commercial POC</b>	
<b>Technical POC</b>	
<b>Operator</b>	
<b>Description</b>	ORQUE and WAGRAM bridge to NETN

## Federation

<b>Federate Name</b>	ORQUE&WAGRAM
<b>Federate Type</b>	ALLIGATOR
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## Booster

<b>Name</b>	Booster
<b>Full Name</b>	Pitch Booster
<b>Version</b>	1.2
<b>System</b>	Simulation Infrastructure

<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Per-Philip Sollin
<b>Operator</b>	Lennart Olsson
<b>Description</b>	Private Simulation Network Overlay
<b>Purpose</b>	Simulation Interoperability

## Commander Agent

<b>Name</b>	Commander Agent
<b>System</b>	Commander
<b>Full Name</b>	Pitch Commander Agent
<b>Federate Name</b>	Commander
<b>Federate Type</b>	Commander Agent
<b>Version</b>	2.2.0
<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Björn Lövstrand
<b>Operator</b>	Björn Lövstrand
<b>Description</b>	Agent for monitoring and control

### Federation

<b>Federate Name</b>	Commander
<b>Federate Type</b>	Commander Agent
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## GE Adapter

<b>Name</b>	Pitch GE Adapter
<b>System</b>	Google Earth
<b>Full Name</b>	Pitch GE Adapter
<b>Federate Name</b>	Google Earth
<b>Federate Type</b>	GE Adapter
<b>Version</b>	1.4
<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Björn Lövstrand
<b>Operator</b>	Björn Lövstrand
<b>Description</b>	Google Earth Adapter for HLA

### Federation

<b>Federate Name</b>	Google Earth
<b>Federate Type</b>	GE Adapter
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## ITC

<b>Name</b>	ITC
<b>Full Name</b>	ITC Flames
<b>Version</b>	
<b>System</b>	ICC
<b>Commercial POC</b>	Clive Wood
<b>Technical POC</b>	Clive Wood
<b>Operator</b>	Clive Wood/Richard Hall
<b>Description</b>	Constructive Air Simulation and ICC stimulation

## Federation

<b>Federate Name</b>	ITC Flames
<b>Federate Type</b>	ITC Flames
<b>HLA Interface</b>	HLA 1.3
<b>Federate Instances</b>	1

## JCATS Client

<b>Name</b>	JCATS Client
<b>System</b>	JCATS
<b>Full Name</b>	JCATS Client
<b>Version</b>	
<b>Commercial POC</b>	
<b>Technical POC</b>	
<b>Operator</b>	
<b>Description</b>	JCATS Client

## JTLS Client

<b>Name</b>	JTLS Client
<b>System</b>	JTLS
<b>Full Name</b>	JTLS Client
<b>Version</b>	
<b>Commercial POC</b>	
<b>Technical POC</b>	
<b>Operator</b>	
<b>Description</b>	JTLS Client

## LVC Game

<b>Name</b>	LVC Game
<b>System</b>	VBS2
<b>Full Name</b>	LVC Game
<b>Federate Name</b>	VBS2

<b>Federate Type</b>	LVC Game
<b>Version</b>	3.1.921.27503
<b>Commercial POC</b>	
<b>Technical POC</b>	Caroline Pettitt-Morris
<b>Operator</b>	
<b>Description</b>	VBS2 Bridge to HLA

### Federation

<b>Federate Name</b>	VBS2
<b>Federate Type</b>	LVC Game
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## NETN Service Manager

<b>Name</b>	NETN Service Manager
<b>System</b>	Integration Support
<b>Full Name</b>	Pitch NETN Service Manager
<b>Version</b>	MSG-068
<b>Commercial POC</b>	
<b>Technical POC</b>	Lennart Olsson
<b>Operator</b>	Lennart Olsson
<b>Description</b>	Test tool for NETN Consumer-Provider Patterns

### Federation

<b>Federate Name</b>	Service Manager
<b>Federate Type</b>	NETN Service Manager
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

## pRTI 1516

<b>Name</b>	pRTI 1516
<b>Full Name</b>	Pitch pRTI 1516
<b>Version</b>	4.2
<b>System</b>	Simulation Infrastructure
<b>Commercial POC</b>	Björn Lövstrand
<b>Technical POC</b>	Per-Philip Sollin
<b>Operator</b>	Lennart Olsson
<b>Description</b>	HLA RTI

## Recorder

<b>Name</b>	Recorder
-------------	----------

<b>System</b>	Integration Support
<b>Full Name</b>	Pitch Recorder
<b>Version</b>	1.5
<b>Commercial POC</b>	Björn Löfstrand
<b>Technical POC</b>	Lennart Olsson
<b>Operator</b>	Lennart Olsson
<b>Description</b>	Simulation Traffic Record, Analysis and Playback

#### Federation

<b>Federate Name</b>	Pitch Recorder
<b>Federate Type</b>	Recorder
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

#### TYR Client

<b>Name</b>	TYR Client
<b>System</b>	TYR
<b>Full Name</b>	CATS TYR Client
<b>Version</b>	3.2
<b>Commercial POC</b>	Torsten Bernström
<b>Technical POC</b>	Max Karlström
<b>Operator</b>	Max Karlström
<b>Description</b>	TYR Client Federate

#### Federation

<b>Federate Name</b>	TYR Client
<b>Federate Type</b>	TYR Client
<b>HLA Interface</b>	IEEE 1516-2010
<b>Federate Instances</b>	1

#### Visual OMT

<b>Name</b>	Visual OMT
<b>System</b>	Integration Support
<b>Full Name</b>	Pitch Visual OMT 1516
<b>Version</b>	2.0
<b>Commercial POC</b>	Björn Löfstrand
<b>Technical POC</b>	Lennart Olsson
<b>Operator</b>	Lennart Olsson
<b>Description</b>	HLA Object Model Development Tool

## Appendix 3 - Hardware

Name	System	Owner	Location	IP	Tech POC
Display Control Laptop	AV System, PLEXcomm	Pitch	SAF Booth	192.168.10.07	Per-Philip Sollin
Google Earth Laptop	Google Earth, PLEXcomm	FMV	SAF Booth	192.168.10.11	Björn Lofstrand
RTI and Booster Laptop	Simulation Infrastructure, Integration Support, PLEXcomm	FMV	SAF Booth	192.168.10.12 + Public IP	Lennart Olsson
TYR Server Laptop	TYR	FMV	SAF Storage	192.168.10.13	Max Karlström
TYR Client Laptop	TYR, PLEXcomm	FMV	SAF Booth	192.168.10.14	Max Karlström
JCATS Server Laptop	JCATS	JFCOM	SAF Storage	192.168.10.15	Thierry Grom
JCATS Client Laptop	JCATS, PLEXcomm	JFCOM	SAF Booth	192.168.10.16	Thierry Grom
ITC Laptop	ICC, PLEXcomm	NC3A	NATO Booth	192.168.10.17	Clive Wood
ICC Laptop	ICC	NC3A	NATO Booth	192.168.10.18	Clive Wood
ORQUE Laptop	ORQUE	DGA	NATO Booth	192.168.10.19	Jose Ruiz
WAGRAM Laptop	WAGRAM	DGA	NATO Booth	192.168.10.20	Jose Ruiz
ALLIGATOR Laptop	ORQUE, WAGRAM	DGA	NATO Booth	192.168.10.21	Jose Ruiz
JTLS Client Laptop	JTLS, PLEXcomm	JWC	NATO Booth	192.168.10.22	Andy Brown
JTLS Server Laptop	JTLS	JWC	SAF Storage	192.168.10.23	Andy Brown
VBS2 UK Laptop	VBS2	DSTL	NATO Booth	192.168.10.24	Caroline Pettitt-Morris
LVC Game Laptop	VBS2, PLEXcomm	DSTL	NATO Booth	192.168.10.25	Caroline Pettitt-Morris
KORA	KORA	IABG	Ottobrunn Site	Remote Site	Karl-Heinz Neumann
VR-Forces	VR-Forces	ESP MoD	Madrid Site	Remote Site	Patricio Jimenez
External Monitor NATO Right	AV System	JFCOM	NATO Booth		Jim Janele
External Monitor NATO Center	AV System	JFCOM	NATO Booth		Jim Janele
External Monitor NATO Left	AV System	JFCOM	NATO Booth		Jim Janele
External Monitor FedExCtrl	AV System	JFCOM	SAF Booth		Jim Janele
16x16 Video Switch	AV System	JFCOM	SAF Storage		Jim Janele

## 16x16 Video Switch

<b>Name</b>	16x16 Video Switch
<b>System</b>	AV System
<b>Owner</b>	JFCOM
<b>Location</b>	SAF Storage
<b>Tech POC</b>	Jim Janele

## ALLIGATOR Laptop

<b>Name</b>	ALLIGATOR Laptop
<b>System</b>	ORQUE, WAGRAM
<b>Owner</b>	DGA
<b>Location</b>	NATO Booth
<b>IP</b>	192.168.10.21
<b>Tech POC</b>	Jose Ruiz
<b>Video Switch Input #</b>	
<b>Video Out Resolution</b>	

## Display Control Laptop

<b>Name</b>	Display Control Laptop
<b>System</b>	AV System, PLEXcomm
<b>Owner</b>	Pitch
<b>Location</b>	SAF Booth
<b>IP</b>	192.168.10.07
<b>Tech POC</b>	Per-Philip Sollin

## External Monitor FedExCtrl

<b>Name</b>	External Monitor FedExCtrl
<b>System</b>	AV System
<b>Owner</b>	JFCOM
<b>Location</b>	SAF Booth
<b>Tech POC</b>	Jim Janele
<b>Video Output #</b>	5

## External Monitor NATO Center

<b>Name</b>	External Monitor NATO Center
<b>System</b>	AV System
<b>Owner</b>	JFCOM
<b>Description</b>	60" Plasma
<b>Location</b>	NATO Booth
<b>Tech POC</b>	Jim Janele
<b>Video Output #</b>	1

## External Monitor NATO Left

<b>Name</b>	External Monitor NATO Left
<b>System</b>	AV System
<b>Owner</b>	JFCOM
<b>Location</b>	NATO Booth
<b>Tech POC</b>	Jim Janele



Video Output #	2
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## External Monitor NATO Right

Name	External Monitor NATO Right
System	AV System
Owner	JFCOM
Location	NATO Booth
Tech POC	Jim Janele
Video Output #	3

## Google Earth Laptop

Name	Google Earth Laptop
System	Google Earth, PLEXcomm
Owner	FMV
Location	SAF Booth
IP	192.168.10.11
Tech POC	Björn Löfstrand
Video Switch Input #	7
Video Out Resolution	

## ICC Laptop

Name	ICC Laptop
System	ICC
Owner	NC3A
Location	NATO Booth
IP	192.168.10.18
Tech POC	Clive Wood
Video Switch Input #	9
Video Out Resolution	

## ITC Laptop

Name	ITC Laptop
System	ICC, PLEXcomm
Owner	NC3A
Location	NATO Booth
IP	192.168.10.17
Tech POC	Clive Wood
Video Switch Input #	10
Video Out Resolution	

## JCATS Client Laptop

<b>Name</b>	JCATS Client Laptop
<b>System</b>	JCATS, PLEXcomm
<b>Owner</b>	JFCOM
<b>Location</b>	SAF Booth
<b>IP</b>	192.168.10.16
<b>Tech POC</b>	Thierry Grom
<b>Video Switch Input #</b>	2
<b>Video Out Resolution</b>	

### JCATS Server Laptop

<b>Name</b>	JCATS Server Laptop
<b>System</b>	JCATS
<b>Owner</b>	JFCOM
<b>Location</b>	SAF Storage
<b>IP</b>	192.168.10.15
<b>Tech POC</b>	Thierry Grom

### JTLS Client Laptop

<b>Name</b>	JTLS Client Laptop
<b>System</b>	JTLS, PLEXcomm
<b>Owner</b>	JWC
<b>Location</b>	NATO Booth
<b>IP</b>	192.168.10.22
<b>Tech POC</b>	Andy Brown
<b>Video Switch Input #</b>	13
<b>Video Out Resolution</b>	

### JTLS Server Laptop

<b>Name</b>	JTLS Server Laptop
<b>System</b>	JTLS
<b>Owner</b>	JWC
<b>Location</b>	SAF Storage
<b>IP</b>	192.168.10.23
<b>Tech POC</b>	Andy Brown
<b>Video Switch Input #</b>	
<b>Video Out Resolution</b>	

### LVC Game Laptop

<b>Name</b>	LVC Game Laptop
<b>System</b>	VBS2, PLEXcomm
<b>Owner</b>	DSTL

<b>Location</b>	NATO Booth
<b>IP</b>	192.168.10.25
<b>Tech POC</b>	Caroline Pettitt-Morris
<b>Video Switch Input #</b>	
<b>Video Out Resolution</b>	

## ORQUE Laptop

<b>Name</b>	ORQUE Laptop
<b>System</b>	ORQUE
<b>Owner</b>	DGA
<b>Location</b>	NATO Booth
<b>IP</b>	192.168.10.19
<b>Tech POC</b>	Jose Ruiz
<b>Video Switch Input #</b>	16
<b>Video Out Resolution</b>	

## RTI and Booster Laptop

<b>Name</b>	RTI and Booster Laptop
<b>System</b>	Simulation Infrastructure, Integration Support, PLEXcomm
<b>Owner</b>	FMV
<b>Location</b>	SAF Booth
<b>IP</b>	192.168.10.12 + Public IP
<b>Tech POC</b>	Lennart Olsson

## TYR Client Laptop

<b>Name</b>	TYR Client Laptop
<b>System</b>	TYR, PLEXcomm
<b>Owner</b>	FMV
<b>Location</b>	SAF Booth
<b>IP</b>	192.168.10.14
<b>Tech POC</b>	Max Karlström
<b>Video Switch Input #</b>	8
<b>Video Out Resolution</b>	

## TYR Server Laptop

<b>Name</b>	TYR Server Laptop
<b>System</b>	TYR
<b>Owner</b>	FMV
<b>Location</b>	SAF Storage
<b>IP</b>	192.168.10.13
<b>Tech POC</b>	Max Karlström

## WAGRAM Laptop

<b>Name</b>	WAGRAM Laptop
<b>System</b>	WAGRAM
<b>Owner</b>	DGA
<b>Location</b>	NATO Booth
<b>IP</b>	192.168.10.20
<b>Tech POC</b>	Jose Ruiz
<b>Video Switch Input #</b>	14
<b>Video Out Resolution</b>	

## VBS2 UK Laptop

<b>Name</b>	VBS2 UK Laptop
<b>System</b>	VBS2
<b>Owner</b>	DSTL
<b>Location</b>	NATO Booth
<b>IP</b>	192.168.10.24
<b>Tech POC</b>	Caroline Pettitt-Morris
<b>Video Switch Input #</b>	12
<b>Video Out Resolution</b>	

## Annex G – MSG-068 NETN EXPERIMENT FIRST IMPRESSION REPORT

(November 5, 2010)

### G.1 AIM AND SCOPE

HQ-SACT, JWC, JFTC, NC3A, NATO M&S CoE and Nations, i.e., Bulgaria, France, Germany, Hungary, the Netherlands, Spain, Sweden, Turkey, the UK and the US, conducted a standalone experiment, NETN EXPERIMENT 10, from 25 October – 5 November 2010, distributed, in Bydgoszcz, The Hague, Paris, Porton Down and Ottobrunn in order to produce the best possible environment within which to obtain data and information required to validate the MSG-068 recommendations for:

- A secure, persistent, on-demand training capability that integrates national centers and NATO;
- Capability and readiness of NATO, Nations and national simulation centers to link into NETN;
- Distributed simulation integrating NATO and national M&S capabilities;
- Multi-granularity;
- Technical standards;
- Distributed training involving national and NATO C2 and simulation systems; and
- Shared scenarios.

The experiment achieved the objectives. The final report for the experiment will be a part of the final MSG-068 technical report. This document is the first impression report about the hypothesis tested during the experiment.

### G.2 OBSERVATIONS

Figure G-1 is the statistics about observations as of November 5 at 09:00 (Z). The full list of observations is at Appendix 2.

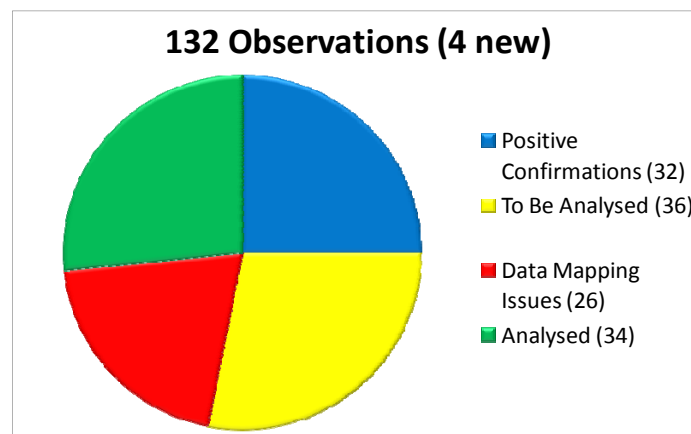


Figure G-1: Observation Statistics.

## ANNEX G – MSG-068 NETN EXPERIMENT FIRST IMPRESSION REPORT

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Draft recommendations based on the analysis of observations are as following:

- Network performance must be ensured before the event and must be constantly monitored.
- FAFD must specify:
  - The order and timing of joining the federation. *Observations show that under specific conditions, the order of joining the federation is important. Other observations show that late joiners had issues joining.*
  - The conditions of using the FOM (flat, modular, mixed). *Observations show that it is important what type of FOM federates use, since this influences the required joining sequence.*
- There must be a mechanisms to ensure compliance of federates:
  - Federates must be compliant with technical standards, FAFD and FOM. *Observations show that federates fail/crash due to not handling various data correctly.*
  - Data mapping issues must be prevented. *Observations show that federates fail to perform due to data not being correctly mapped.*
  - Failure of one federate shouldn't stop the whole operation. *Observations show that if a federate fails, the whole operation stops and cannot continue until the issue is fixed. In an exercise, it may not be possible to just skip an important phase of an operation. A backup solution is needed. C2 systems need to be taken into account here as well.*
  - It must be clear how federates are time synchronized and time co-ordinated. The federation was not time constrained. *Observations show that some patterns require complex time co-ordination.*
  - QoS must be ensured at application level (HLA) to prevent non-important communication block important communication. *Observations show that federates were blocked by update requests while trying to perform an important activity.*
  - Terrain must be correlated across the whole federation. *Observation show that entities appear at unexpected locations.*
- Further recommendations:
  - There should be mechanisms to allow dynamic entities and interactions. *Observations show that there dynamic entities and interactions were required but are currently not supported.*
  - Sustain robustness in federation execution (Booster-like). *Observations show that federation could recover from short network failures.*
  - There should be mechanisms to monitor federation execution that enable instant analysis of what is/was going on in the federation. *Observations show that it is difficult to analyse even simple failures in the federation.*
  - Means to coordinate simulation operators is necessary. *Observations show that co-ordination was good at high level (federation steering), but it was not good at lower level (federate interaction). Examples are airspace management, aircraft location co-ordination during refuelling.*
  - A procedure or tool is needed to detect and remove/hide unwanted/leftover objects from the federation. *Observations show that federates do not remove objects (e.g., detonations) from the federation, which clutters the picture.*

- Ensure that all simulation developers use the same, approved, source code base for en/decoding of HLA classes and interactions.
- Include perception in the FOM. *Aggregate level models are expected to provide side-wide perception. They need perception information from entity-level models.*
- Issues arising from multi-resolution (location, tracks, damage state, etc.) should be addressed and properly understood by operators. *Observations show that operators of entity-level models can be confused by behaviour of shadowed entities controlled by aggregate-level models.*

### **G.3 THE FIRST IMPRESSION OF THE EXPERIMENT AUDIENCE ABOUT THE HYPOTHESIS TESTED IN THE EVENT**

#### ***Hypothesis 1: MSG-068 NETN Reference FOM and Federation Agreement Recommendations are Feasible for NETN***

MSG-068 FAD is proved to be feasible. However, MSG-068 FAD is not as comprehensive as it could be. For example:

- FAD is not tested for large scenarios with large number of entities.
- Current FAD does not include agreements for Transfer of Ownership.
- Time management and DDM services are not tested.

FOM and FAD agreements are not enough for NETN. There needs to be more, e.g., data correlation and data reconciliation process were not entirely sufficient.

FEDEP should be used. For example, interoperability was achieved between federates during the air refuel injection, but the representation of the process is still not sufficient. FEDEP could have helped that.

There are unnecessary complications, especially in the RPR2 FOM, which is the standalone baseline FOM for NETN. FAD should address them. FAD can specify which parts are not used by any federate.

#### ***Hypothesis 2: CFBLNet is Feasible as Persistent Network Architecture for NETN***

It is true as long as the bearer network satisfies QoS requirements for NETN.

#### ***Hypothesis 3: NLVC is Compatible with the NETN Reference Federation Architecture***

Yes. NLVC, as tested, is compatible with the current MSG-068 FOM and FAD.

The reverse hypothesis has not been tested during the experiment. Some audience has concerns about the reverse hypothesis because RPR2 FOM supports only a subset of capabilities that some federates can offer to the federation. However, new FOM modules can be added to address this issue in the future as needed.

#### ***Hypothesis 4: NLVC is a Viable and Useful Tool to Support Distributed FAC Training Over a Wide Area Network***

Yes.

*Hypothesis 5: VBS2 NATO is a Viable and Useful Tool to Support Distributed C-IED Training*

Yes.

#### **G.4 CONCLUSION**

The experiment flow is at Appendix 1. The detailed observations are collected by the analysis team by using JEMM application and enclosed at Appendix 2. They will be analyzed before the final report is released.

#### **Appendices**

- 1 – MSG-068 Experimentation Flow
- 2 – MSG-068 Experiment Observations



## EXERCISE SCRIPT REPORT

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### 01: CFBLNet Infrastructure

#### 01.02 Establish CFBLNet and the Internet connections (*Storyline*)

##### Story

All nations and NATO organizations connect to CFBLNet.

#### 01.02.O01 Outcome for ping and ftp tests (*Intended Storyline Outcome*)

##### Description

- Ensure that the connections (both the Internet and CFBLNet) are ready for the experiment.
- Make propagation delay and throughput measurements

#### 01.02.A01 NETN-U open (*Action*)

Planned Date:	27OCT2010 0800Z	State	Completed
Actual Date		Protagonist	
Duration	1h	Excon Cell	
Location		Actors	

##### Description

NETN-U is open and ready for connections from experiment participants

#### 01.02.A02 JFTC connects to NETN-U (*Action*)

Planned Date:	27OCT2010 0830Z	State	Completed
Actual Date		Protagonist	
Duration	30m	Excon Cell	
Location		Actors	

##### Description

JFTC connects to NETN-U via its PoP

#### 01.02.I01 [EXAMPLE] JFTC connected to NETN-U (*Injection*)

Planned Date:	27OCT2010 0845Z	State	Draft
Actual Date		Means	CHAT
Injector	JFTC RC	Coordinating Cell	EXPCEN
Location		Receiver	NATO,

##### Description

JFTC reports successful connection to NETN-U

#### 01.02.A03 EXPCELL-ACT prepares a large file (20 GB) (*Action*)

Planned Date:	27OCT2010 1600Z	State	Completed
Actual Date		Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	

##### Description

EXPCELL-ACT prepares a 20 GB file with any content in it, and informs all the other EXPCELL about

the location of the file. The other experimentation cells should be able to ftp the file. The file should be available both in CFBLNet and in the Internet.

 **01.02.I04 Repeat ping tests in the Internet (Injection)**

Planned Date:	28OCT2010 1200Z	State	Cancelled
Actual Date		Means	E-MAIL
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCCELL-NLD, EXPCCELL-ACT, EXPCCELL-GBR, EXPCCELL-SWE, EXPCCELL-FRA, EXPCCELL-DEU,

**Description**

Repeat Injection 01-02-I02 for the Internet

 **01.02.R01 Throughput, delay and jitter report (Return)**

Planned Date:	28OCT2010 1500Z	State	Draft
Actual Date			
Sender	EXPCCELL-NC3A	Receiver	EXPCEN

**Description**

EXPCCELL-NC3A collects the observations and reports from all experimentation cells and send a report to EXPCEN. The first draft of the report should be send before the coordination conference on October 28.

 **01.02.I02 Start ping tests (Injection)**

Planned Date:	28OCT2010 0900Z	State	Injected
Actual Date	05NOV2010 0731Z	Means	CHAT
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCCELL-NLD, EXPCCELL-ACT, EXPCCELL-GBR, EXPCCELL-SWE, EXPCCELL-FRA, EXPCCELL-DEU,

**Description**

All experimentation cells ping all the other experimentation cells one by one, and observe the round trip time.

 **01.02.I03 Start ftp tests (Injection)**

Planned Date:	05NOV2010 0801Z	State	Injected
Actual Date	05NOV2010 0731Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCCELL-ACT,

**Description**

- All experimentation cells ftp the file from EXPCCELL-ACT
- All experimentation cells ftp the same file from EXPCCELL-SWE
- EXPCCELL-FRA, EXPCCELL-DEU ftp the same file from EXPCCELL-NL; EXPCCELL-ACT, EXPCCELL-SWE ftp the same file from EXPCCELL-DEU; EXPCCELL-UK and EXPCCELL-NL ftp the same file from EXPCCELL-ACT. All ftp at this item should start almost at the same time. The observations should be carried out when all sites are ftping.

 **01.02.I05 Repeat ftp tests for the Internet (Injection)**

Planned Date:	28OCT2010 1230Z	State	Injected
Actual Date	05NOV2010 0731Z	Means	E-MAIL
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCCELL-NLD, EXPCCELL-ACT, EXPCCELL-GBR, EXPCCELL-SWE, EXPCCELL-FRA, EXPCCELL-DEU,

### Description

Repeat the same tests as in the Injection 01-02-I03 for the Internet

## [01.03 Manage and monitor CFBLNet infrastructure \(Storyline\)](#)

### Story

NC3A manages and monitors the CFBLNet infrastructure.

#### [01.03.O01 Monitor CFBLNet \(Intended Storyline Outcome\)](#)

### Description

EXPCCELL-NC3A monitors the following throughout the experiment:

- Utilization of bandwidth
- Throughput
- Round trip delay
- Jitter

#### [01.03.R01 Report the CFBLNet measurements \(Return\)](#)

Planned Date:	27OCT2010 0000Z	State	Draft
Actual Date			
Sender	EXPCCELL-NC3A	Receiver	EXPCEN

### Description

Report about the CFBLNet Measurements:

- Utilization
- Throughput
- Round trip delay
- Jitter

## 02: Operational Scenarios

### [02.01 Logistics \(MEDEVAC\) \(Storyline\)](#)

### Story

Two troops modeled in VR-Forces by EXPCCELL-ESP are wounded. A medical evacuation plan is developed by the operational people in EXPCCELL-ACT send their plan to MEDEVAC response cell in EXPCCELL-DEU. Then EXPCCELL-DEU implements this plan in KORA to evacuate the wounded troops modelled in VR-Forces. All incident is also observed in the other models (i.e., JCATS, JTLS, TYR, VBS2).

#### [02.01.O01 MSG-068 Federation \(Intended Storyline Outcome\)](#)

### Description

Prove the operational usefulness of MSG-068 federation and concept.

#### [02.01.R01 Report about MEDEVAC Experiment \(Return\)](#)

Planned Date:	27OCT2010 0000Z	State	Draft
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Actual Date  
Sender EXPCELL-DEU Receiver EXPGEN

**Description**

Report about the feed back from the logistics experimentation audience.

 **02.01.I01 Operational planning (Injection)**

Planned Date: 04NOV2010 0830Z State Injected  
Actual Date 03NOV2010 1149Z Means DELIVERED IN PERSON  
Injector EXPCELL-DEU Coordinating Cell EXPCELL-DEU  
Location Receiver Logistics Audience,

**Description**


Information of Experimentation Audience about planned engagement against terrorist camp

 **02.01.I02 Capability gap identification focused on medical support (Injection)**

Planned Date: 03NOV2010 1149Z State Injected  
Actual Date 03NOV2010 1150Z Means DELIVERED IN PERSON  
Injector UNKNOWN Coordinating Cell EXPCELL-DEU  
Location Receiver Audience,

**Description**

Information of Experimentation Audience about the need for additional MEDEVAC capacity

 **02.01.I03 Request and provision of additional medical support (Injection)**

Planned Date: 03NOV2010 1150Z State Injected  
Actual Date 03NOV2010 1150Z Means PHONE  
Injector UNKNOWN Coordinating Cell EXPCELL-DEU  
Location Receiver Audience,

**Description**

Based on the operational planning of the combat troops LOCON requests additional MEDEVAC support

 **02.01.I04 OPORD (Operation Order) Distribution (Injection)**

Planned Date: 03NOV2010 1150Z State Injected  
Actual Date 03NOV2010 1150Z Means DELIVERED IN PERSON  
Injector UNKNOWN Coordinating Cell EXPCELL-DEU  
Location Receiver Audience,

**Description**

Information of Experimentation Audience about the medical reinforcement planning

 **02.01.A01 Create TIC in VR-Forces and JCATS (Action)**

Planned Date: 04NOV2010 0857Z State Completed  
Actual Date 04NOV2010 0852Z Protagonist  
Duration 2h Excon Cell EXPCELL-ESP  
Location Actors JEMM, JEMM, JEMM,

**Description**

Create a group of terrorists (the number is not important) and a blue team in contact with the terrorists. Two of the team embers are wounded. (58o38'12"N 15o18'58"E).

 **02.01.I05 Start the MEDEVAC** *(Injection)*

Planned Date:	04NOV2010 0900Z	State	Injected
Actual Date	04NOV2010 0852Z	Means	JEMM
Injector	UNKNOWN	Coordinating Cell	EXPCELL-DEU
Location		Receiver	EXPCELL-ACT, Logistics Audience, EXPCELL-ESP, EXPCELL-DEU,

**Description**


HICON deploys medical elements according to OPPLAN

 **02.01.A02 Call Immediate Report to MEDEVAC Audience in EXPCELL-ACT** *(Action)*

Planned Date:	04NOV2010 0902Z	State	Completed
Actual Date	04NOV2010 0909Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ESP
Location		Actors	JEMM, JEMM,

**Description**

EXPCELL-ESP sends an immediate report and then carry the wounded personnel to the safe house which will become Casualty Collecting Point which is at 58o38'98"N 15o18'22"E.

 **02.01.A03 EXPCELL-ESP sends a METHANE to the MEDEVAC Audience in EXPCELL-A** *(Action)*

Planned Date:	04NOV2010 0907Z	State	Completed
Actual Date	04NOV2010 0911Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ESP
Location		Actors	JEMM,

**Description**

EXPCELL-ESP sends a METHANE report and gives the details about the location (CCP) and casualties.

 **02.01.A04 MEDEVAC Audience request evacuation of the casualties** *(Action)*

Planned Date:	04NOV2010 0909Z	State	Completed
Actual Date	04NOV2010 0923Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

MEDEVAC Audience in EXPCELL-ACT request from EXPCELL-DEU the evacuation of casualties by helicopter

 **02.01.A05 Evacuate the casualties** *(Action)*

Planned Date:	04NOV2010 0912Z	State	Completed
Actual Date	04NOV2010 0931Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-DEU
Location		Actors	JEMM, JEMM,


**Description**

A helicopter in Kora evacuates the wounded personnel in VR-Forces.

 **02.02 C-IED (Storyline)**


**Story**

Two subject matter experts (SME) will be tasked by HQ-SACT and one staff officer will be tasked by JFTC for this incident. These SMEs and the staff officer will act as the trainers for a distributed C-IED training using VBS2-NATO as the training tool. Apart from that 10 trainees will be assigned by HQ-SACT. Trainers will be in EXPCELL-ACT in Bydgoszcz, and the trainees will stay in Norfolk. All the data communications will be via the Internet.

 **02.02.O01 Analyze distributed training effectiveness (Intended Storyline Outcome)**

**Description**

1. Trainers will be surveyed to determine if they were able to conduct effective C-IED training by using VBS2-NATO although the trainees are in a remote site.
2. The following will also be examined:
  - Time and effort required to prepare the training.
  - The user friendliness of the overall procedures and systems for the trainees.
  - The time and effort required to actually establish the training session.

 **02.02.A02 Start the VBS2 scripts and scenario to support the training (Action)**

Planned Date:	04NOV2010 1500Z	State	Completed
Actual Date		Protagonist	
Duration	1d 2h	Excon Cell	EXPCELL-ACT
Location		Actors	VBS2 (NATO),

**Description**

The simulation orders and scenario is not known yet. The trainers will develop them and coordinate them with the operators at least 24 hour before the initial injection in the storyline.

 **02.02.R01 (Return)**

Planned Date:	05NOV2010 1000Z	State	Draft
Actual Date			
Sender	C-IED Audience	Receiver	EXPEN

**Description**

Completed questioneries

 **02.02.A01 Establish connectivity (Action)**

Planned Date:	05NOV2010 1430Z	State	Unknown
Actual Date		Protagonist	
Duration	30m	Excon Cell	EXPCELL-ACT
Location		Actors	VBS2 (NATO),

**Description**

Check and ensure that the trainees in HQ-SACT can access VBS2-NATO server in JFTC, and they have voice communications with the trainers.

 **02.02.I01 Start lessons planned (Injection)**

Planned Date:	05NOV2010 1500Z	State	Draft
Actual Date		Means	DELIVERED IN PERSON
Injector	EXPCELL-ACT	Coordinating Cell	EXPCELL-ACT

Location Receiver C-IED Audience,

**Description**

Trainers from C-IED Audience will be asked to start their training session.

 **02.03 NLVC-1 (Storyline)**

**Story**

Forward observers located in JFTC (EXPCELL-ACT) and using FACSIM FAC station controls air mission (air to ground attack) that fly in FACSIM (F16). FLAMES (F18) in JFTC (EXPCELL-ACT controlled) fly combat air patrol. 3 VBS2-VTK UAVs observe villiage (1 X GBR @ DSTL, 1 X NLD @ TNO, 1 X JWC UAV but controlled from JFTC). Targets are armed vehicles in the villiage and any escaping vehicles. The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

 **02.03.O01 NLVC concept and federation (Intended Storyline Outcome)**

**Description**

The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

 **02.03.I01 FACs are given tactical briefing (Injection)**

Planned Date:	04NOV2010 1000Z	State	Injected
Actual Date	04NOV2010 0943Z	Means	DELIVERED IN PERSON
Injector	EXPCELL-ACT	Coordinating Cell	EXPCELL-ACT
Location		Receiver	NLVC Audience,

**Description**

The forward air controllers (FACs) receive a tactical briefing to set the situation for the execution of the vignette. The briefing will direct them to destroy armed vehicles in and around the village.

 **02.03.A01 FACs initiate process to coordinate F16 support (Action)**

Planned Date:	04NOV2010 1200Z	State	Completed
Actual Date	04NOV2010 1216Z	Protagonist	
Duration	3h	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM,

**Description**

NLVC scenario starts. FAC observes villiage and identifies targets that will consist of 1 toyota land cruiser and 3 flatbed trucks, all armed with machineguns. FAC will initiate putting together his call to the aircraft (F16). When he is done he will contact aircraft and talk him onto the target until the target is destroyed. 2 X F18s continue overhead air patrol while 3 UAVs watch villiage. Executing simulations are FACSIM (FAC station @ JFTC), FLAMES, FACSIM (Pilot station @ TNO). Observing simulations are VBS2 (@ TNO and UK), VBS2 (@ JFTC), JCATS (@ JFTC).

 **02.03.A02 Vehicles attempt escape from village (Action)**

Planned Date:	04NOV2010 1217Z	State	Completed
Actual Date	04NOV2010 1233Z	Protagonist	
Duration	3h	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM,

JEMM, JEMM, JEMM, JEMM,  
 JEMM, JEMM, JEMM,

**Description**

FAC observes escamping terrorists moving to the south east of the village. Decides to redirect F16 onto these vehicles to prevent escape. 2 X F18s continue overhead air patrol while 3 UAVs watch village. Executing simulations are FACSIM (FAC station @ JFTC), FLAMES, FACSIM (Pilot station @ TNO). Observing simulations are VBS2 (@ TNO and UK), VBS2 (@ JFTC), VR-Forces (@ FRA), WAGRAM (@ FRA), ORQUE (@ FRA), JCATS (@ JFTC), JTLS (@ JFTC).

 **02.03.R01 Observation reports by NLVC Audience (Return)**

Planned Date:	04NOV2010 1245Z	State	Draft
Actual Date			
Sender	NLVC Audience	Receiver	EXPCEN


**Description**

Send the following reports to EXPCEN:  
 - Technical requirements (bandwidth, delay and jitter) for NLVC federation  
 - Performance reports (crashes, crash details, execution speed, time to start up the federation)  
 - User observation reports

 **02.04 Shared Scenarios (Storyline)**

**Story**

A prototype of the tool designed for the shared scenarios project and shared scenario procedures will be experimented. All the national experiment cells and ACT experiment cell will join to this experiment.

 **02.04.O01 Comments on shared scenarios (Intended Storyline Outcome)**

**Description**

Receive feed back from the nations on shared scenarios concept and on the demonstrator.

 **02.04.A01 Prepare Shared Scenario Tool for the experiment (Action)**

Planned Date:	03NOV2010 1600Z	State	Scheduled
Actual Date		Protagonist	
Duration	1d 0h	Excon Cell	EXPCEN
Location		Actors	

**Description**

Prepare the Shared Scenario Tool for the experiment by installing it and loading the appropriate databases. The Shared Scenario Tool should be accessible from the Internet. Prepare also a questionnaire and send to all Experiment Cells.

 **02.04.A02 Access portal on internet server and download submission form (Action)**

Planned Date:	04NOV2010 1527Z	State	Ongoing
Actual Date	04NOV2010 1526Z	Protagonist	
Duration	10m	Excon Cell	EXPCCELL-ACT
Location		Actors	


**Description**

Access portal on internet server and download submission form.

URL: <http://82.177.169.139/SharedScenarios/Default.aspx>



then click the link 'Download Scenario Contribution Tool'

 **02.04.A03 Fill in description of a scenario that you have used** (Action)

Planned Date:	04NOV2010 1541Z	State	Ongoing
Actual Date	04NOV2010 1526Z	Protagonist	
Duration	1h	Excon Cell	EXPCELL-ACT
Location		Actors	

**Description**


Fill the description of an exercise scenario that you have used in the past. You can start by adding the setting description and subsequently describe the scenario that was built using the setting.

 **02.04.I02 Briefing to participants on Shared Scenario Library Project** (Injection)

Planned Date:	04NOV2010 1400Z	State	Injected
Actual Date	04NOV2010 1526Z	Means	DELIVERED IN PERSON
Injector	EXPCELL-ACT	Coordinating Cell	EXPEN
Location		Receiver	Audience,

**Description**

Introductory on shared scenario project objectives and role of experiment in achieving them.

 **02.04.I03 Request to access portal and download submission form** (Injection)

Planned Date:	04NOV2010 1556Z	State	Injected
Actual Date	04NOV2010 1526Z	Means	CHAT
Injector	EXPCELL-ACT	Coordinating Cell	EXPEN
Location		Receiver	Audience,

**Description**

Request to download submission form from portal on internet

 **02.04.A04 Send submission back for inclusion** (Action)

Planned Date:	04NOV2010 1627Z	State	Ongoing
Actual Date	04NOV2010 1527Z	Protagonist	
Duration	2m	Excon Cell	EXPCELL-ACT
Location		Actors	

**Description**

Send submission back for inclusion.

Either

- mail to: [blackstone.steven@gmail.com](mailto:blackstone.steven@gmail.com)
- use Skype to transfer file to msg68expcell-nc3a
- use USB Memory stick (JFTC only)

 **02.04.A05 Consolidate inputs into library** (Action)

Planned Date:	04NOV2010 1532Z	State	Scheduled
Actual Date		Protagonist	
Duration	30m	Excon Cell	EXPCELL-ACT
Location		Actors	

**Description**

NC3A shared scenario team consolidate inputs from participants into library

 **02.04.I05 Request to fill in questionnaire (Injection)**

Planned Date:	05NOV2010 0700Z	State	Draft
Actual Date		Means	CHAT
Injector	EXPCCELL-ACT	Coordinating Cell	EXPCEN
Location		Receiver	Audience,

**Description**

Request to fill in questionnaire for the shared scenario library part

 **02.04.I01 Send shared scenarios questionarie to experiment cells (Injection)**

Planned Date:	27OCT2010 0000Z	State	Injected
Actual Date	05NOV2010 0730Z	Means	E-MAIL
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCCELL-NLD, EXPCCELL-ACT, EXPCCELL-GBR, EXPCCELL-SWE, EXPCCELL-ESP, EXPCCELL-FRA, EXPCCELL-DEU,

**Description**

Shared Scenarios observer sends the questionarie to al the experiment cells, which will have access to JEST to answer the questions in the questionarie.

 **02.04.I04 Request to search library (Injection)**

Planned Date:	05NOV2010 0800Z	State	Draft
Actual Date		Means	CHAT
Injector	EXPCCELL-ACT	Coordinating Cell	EXPCEN
Location		Receiver	Audience,

**Description**

Request participants to search the library. find their own submitted scenario. Look for other scenarios.

 **02.04.A06 Search scenario library (Action)**

Planned Date:	05NOV2010 0801Z	State	Unknown
Actual Date		Protagonist	
Duration	45m	Excon Cell	
Location		Actors	

**Description**

Search scenario library  
either through your RTA account: <http://nsrl.rta.nato.int/nsrl/login.do>  
or through:  
<http://82.177.169.139/SharedScenarios>

 **02.04.R01 Report about shared scenarios (Return)**

Planned Date:	05NOV2010 1000Z	State	Draft
Actual Date			

Sender EXPCELL-ACT Receiver EXPCEN

**Description**

Send a report about the feed back from the experimentation cells.

 **02.05 NLVC-2 (Storyline)**

**Story**

Forward observers located in JFTC (EXPCELL-ACT) and using FACSIM FAC station controls air mission (air to ground attack) that fly in FACSIM (F16). FLAMES (F18) in JFTC (EXPCELL-ACT controlled) fly combat air patrol. 3 VBS2-VTK UAVs observe villiage (1 X GBR @ DSTL, 1 X NLD @ TNO, 1 X JWC UAV but controlled from JFTC). Targets are armed vehicles in the villiage and any escaping vehicles. The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

 **02.05.O01 NLVC concept and federation (Intended Storyline Outcome)**

**Description**

The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

 **02.05.I01 FACs are given tactical briefing (Injection)**

Planned Date:	04NOV2010 1000Z	State	Injected
Actual Date	04NOV2010 0943Z	Means	DELIVERED IN PERSON
Injector	EXPCELL-ACT	Coordinating Cell	EXPCELL-ACT
Location		Receiver	NLVC Audience,

**Description**

The forward air controllers (FACs) receive a tactical briefing to set the situation for the execution of the vignette. The briefing will direct them to destroy armed vehicles in and around the village.

 **02.05.R01 Observation reports by NLVC Audience (Return)**

Planned Date:	04NOV2010 1245Z	State	Draft
Actual Date			
Sender	NLVC Audience	Receiver	EXPCEN

**Description**

Send the following reports to EXPCEN:  
 - Technical requirements (bandwidth, delay and jitter) for NLVC federation  
 - Performance reports (crashes, crash details, execution speed, time to start up the federation)  
 - User observation reports

 **02.05.A01 FACs initiate process to coordinate F16 support (Action)**

Planned Date:	04NOV2010 1300Z	State	Completed
Actual Date		Protagonist	
Duration	3h	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM,

**Description**

NLVC scenario starts. FAC observes villiage and identifies targets that will consist of 1 toyota land cruiser and 3 flatbed trucks, all armed with machineguns. FAC will initiate putting together his call to the

aircraft (F16). When he is done he will contact aircraft and talk him onto the target until the target is destroyed. 2 X F18s continue overhead air patrol while 3 UAVs watch village. Executing simulations are FACSIM (FAC station @ JFTC), FLAMES, FACSIM (Pilot station @ TNO). Observing simulations are VBS2 (@ TNO and UK), VBS2 (@ JFTC), JCATS (@ JFTC).

 **02.05.A02 Vehicles attempt escape from village** (*Action*)

Planned Date:	04NOV2010 1301Z	State	Completed
Actual Date		Protagonist	
Duration	3h	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM,

**Description**

FAC observes escamping terrorists moving to the south east of the village. Decides to redirect F16 onto these vehicles to prevent escape. 2 X F18s continue overhead air patrol while 3 UAVs watch village. Executing simulations are FACSIM (FAC station @ JFTC), FLAMES, FACSIM (Pilot station @ TNO). Observing simulations are VBS2 (@ TNO and UK), VBS2 (@ JFTC), VR-Forces (@ FRA), WAGRAM (@ FRA), ORQUE (@ FRA), JCATS (@ JFTC), JTLS (@ JFTC).

 **02.06 NLVC-3** (*Storyline*)

**Story**

Forward observers located in JFTC (EXPCELL-ACT) and using FACSIM FAC station controls air mission (air to ground attack) that fly in FACSIM (F16). FLAMES (F18) in JFTC (EXPCELL-ACT controlled) fly combat air patrol. 3 VBS2-VTK UAVs observe villiage (1 X GBR @ DSTL, 1 X NLD @ TNO, 1 X JWC UAV but controlled from JFTC). Targets are armed vehicles in the villiage and any escaping vehicles. The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capabiltiy to support Distributed Training and Exercises.

 **02.06.O01 NLVC concept and federation** (*Intended Storyline Outcome*)

**Description**

The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capabiltiy to support Distributed Training and Exercises.

 **02.06.I01 FACs are given tactical briefing** (*Injection*)

Planned Date:	04NOV2010 1000Z	State	Injected
Actual Date	04NOV2010 0943Z	Means	DELIVERED IN PERSON
Injector	EXPCELL-ACT	Coordinating Cell	EXPCELL-ACT
Location		Receiver	NLVC Audience,

**Description**

The forward air controllers (FACs) receive a tactical briefing to set the situation for the execution of the vignette. The briefing will direct them to destroy armed vehicles in and around the village.

 **02.06.R01 Observation reports by NLVC Audience** (*Return*)

Planned Date:	04NOV2010 1245Z	State	Draft
Actual Date			
Sender	NLVC Audience	Receiver	EXPCEN

**Description**

Send the following reports to EXPCEN:

- Technical requirements (bandwidth, delay and jitter) for NLVC federation
- Performance reports (crashes, crash details, execution speed, time to start up the federation)
- User observation reports

 **02.06.A01 FACs initiate process to coordinate F16 support** (*Action*)

Planned Date:	04NOV2010 1400Z	State	Completed
Actual Date		Protagonist	
Duration	3h	Excon Cell	EXPCCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM,

**Description**

NLVC scenario starts. FAC observes villiage and identifies targets that will consist of 1 toyota land cruiser and 3 flatbed trucks, all armed with machineguns. FAC will initiate putting together his call to the aircraft (F16). When he is done he will contact aircraft and talk him onto the target until the target is destroyed. 2 X F18s continue overhead air patrol while 3 UAVs watch villiage. Executing simulations are FACSIM (FAC station @ JFTC), FLAMES, FACSIM (Pilot station @ TNO). Observing simulations are VBS2 (@ TNO and UK), VBS2 (@ JFTC), VR-Forces (@ FRA), WAGRAM (@ FRA), ORQUE (@ FRA), JCATS (@ JFTC), JTLS (@ JFTC).

 **02.06.A02 Vehicles attempt escape from villiage** (*Action*)

Planned Date:	04NOV2010 1401Z	State	Completed
Actual Date	04NOV2010 1429Z	Protagonist	
Duration	3h	Excon Cell	EXPCCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM, JEMM,

**Description**

FAC observes escamping terrorists moving to the south east of the villiage. Decides to redirect F16 onto these vehicles to prevent escape. 2 X F18s continue overhead air patrol while 3 UAVs watch villiage. Executing simulations are FACSIM (FAC station @ JFTC), FLAMES, FACSIM (Pilot station @ TNO). Observing simulations are VBS2 (@ TNO and UK), VBS2 (@ JFTC), VR-Forces (@ FRA), WAGRAM (@ FRA), ORQUE (@ FRA), JCATS (@ JFTC), JTLS (@ JFTC).


 **03: Technical Scenarios**

 **03.01 Assault Campaign 1 (Internet with booster)** (*Storyline*)

**Story**

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

 **03.01.O01 Campaign 1** (*Intended Storyline Outcome*)

**Description**

- Prove that
- MSG-068 NETN concept is feasible
  - MSG-068 NETN Reference Federation Architecture is practical

 **03.01.A01 Sea lift (Action)**

Planned Date:	02NOV2010 0856Z	State	Completed
Actual Date	02NOV2010 0856Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM, JEMM,

**Description**

Orque will provide transportation service.  
 WAGRAM will consume the service provided by Orque.  
 VR-Forces will also consume.  
 Port for embarkation is VISBY.  
 Port for debarkation is OXELÖSUND.  
 The units to be transfered will be selected by the related experimentation cell.  
 Once embarkation is complete, simulation time will be increased during transfer.  
 During transport the unit modeled in WAGRAM will be inactive. All subscribing systems shall handle the inactive state and set the new location once the service has been completed and the unit has debarked.

 **03.01.I01 Sea lift (Injection)**

Planned Date:	02NOV2010 0858Z	State	Injected
Actual Date	02NOV2010 0856Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-ESP, EXPCELL-FRA,

**Description**

Sea lift of forces

 **03.01.I02 UAV Recce (Injection)**

Planned Date:	02NOV2010 0911Z	State	Injected
Actual Date	02NOV2010 0909Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-GBR,

**Description**

UAV is tasked to monitor the area

 **03.01.A02 UAV Recce (Action)**

Planned Date:	02NOV2010 0909Z	State	Completed
Actual Date	02NOV2010 0910Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-GBR
Location		Actors	JEMM, JEMM,

**Description**

The UAV Reconnaissance vignette demonstrates the use of RPR-FOM based, platform level, virtual simulation VBS2 and constructive simulation JCATS. Radio simulation is used to model communication between UAV operator and ground commander. JCATS stimulates VBS2 with entities representing the terrorist camp buildings, vehicles and individual humans. VBS2 simulates UAV and generates a UAV feed over the area including visualization of JCATS generated entities.

Fly a predator in VBS2. Initial location for the predator is 57.388402, 18.189365, 2000.

Move entities in JCATS around building1 (58.643177, 15.316343, 0) and building 2 (58.639517,

15.311118, 0)

 **03.01.A03 Cruise missile** (Action)

Planned Date:	02NOV2010 0923Z	State	Completed
Actual Date	02NOV2010 0923Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

This vignette demonstrates the representation of RPR-FOM based munition objects with Weapon Fire and Munition Detonation interactions. Based on target information collected during UAV Recce and Identification, a french SCALP Naval cruise missile is launched from a french FREMM frigate off the coast of Bogaland. The target has been identified as a terrorist weapon depot in the northern group of buildings of the terrorist camp. Location and target parameters are reported and a fire mission communicated using radio (PLEXcomm) to the ShipCmd. The french simulation Orque models the frigate and the cruise missile launch, flight and detonation. Effects are observed by UAV modeled using VBS2.

UAV is a predator and initial location (when the injection is given) is 57.388402, 18.189365, 2000.

The location of FREMM is 57.511, 18.055, 0.

The target of SCALP is a building at location 58.643177, 15.316343, 0.

The building is an entity in JCATS.

 **03.01.I03 Cruise missile** (Injection)

Planned Date:	02NOV2010 0924Z	State	Injected
Actual Date	02NOV2010 0923Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT, EXPCELL-GBR, EXPCELL-FRA,

**Description**

Cruise strike ordered and executed

 **03.01.I04 Ground Strike with CAS/CCA** (Injection)

Planned Date:	02NOV2010 0938Z	State	Injected
Actual Date	02NOV2010 0936Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT, EXPCELL-GBR, EXPCELL-ESP, EXPCELL-FRA,

**Description**

Ground strike with CAS/CCA

 **03.01.A05 Marine blocking** (Action)

Planned Date:	02NOV2010 0951Z	State	Cancelled
Actual Date		Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

USMC in JCATS positioned south of Terrorist Camp in Blocking position. Terrorists (both in JCATS and

VBS2-GBR) moving south from the camp will be engaged by USMC.

 **03.01.A06 MEDEVAC** (Action)

Planned Date:	02NOV2010 0951Z	State	Cancelled
Actual Date		Protagonist	
Duration	0m	Excon Cell	EXPCELL-DEU
Location		Actors	JEMM, JEMM,

**Description**

Evacuate wounded Spanish infantry in VR-Forces using German medevac units.in Kora. The wounded soldier will be in the vicinity of the ground strike. Exact location will be determined based on the ground strike. The wounded soldier can be evacuated to any field hospital selected by EXPCELL-DEU.

 **03.01.I05 Marine Blocking Position** (Injection)

Planned Date:	02NOV2010 0951Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-GBR,

**Description**

Marine blocking position

 **03.01.I06 MEDEVAC** (Injection)

Planned Date:	02NOV2010 0951Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ESP, EXPCELL-DEU,

**Description**

MEDEVAC


 **03.01.A04 Ground strike** (Action)

Planned Date:	02NOV2010 0936Z	State	Completed
Actual Date	02NOV2010 1006Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

Multinational combined ground-strike from north of terrorist camp. Swedish MBT platoon approach from north supported by indirect fire from French 221st Motorized Infantry Battalion and mechanized infantry from US and Spain (Mech Coy: BIMZ I/31 Covadonga 3<sup>rd</sup>Cia).

- FRA (Indirect Fire Support, 221BATINF 48xVBCI + 16xVAB + 8xMo120mm + 16xMilan ) at WAGRAM.
- USA (APC Stryker)at JCATS.
- ESP (AFV ASCOD PIZARRO, BIMZ I/31 Covadonga 3th Coy: 13xPizarro, 4xTruks, 84xsoldiers) at VR-Forces.
- JPECT will conduct an air strike.
- VR-Forces will also conduct a close air support

 **03.01.R01 Report about the results of Campaign 1 with Booster** (Return)



Planned Date:	02NOV2010 1100Z	State	Draft
Actual Date			
Sender	EXPCELL-ACT	Receiver	EXPCEN

**Description**

Report about the results of Campaign 1 with Booster.

 **03.02 Assault Campaign 2 (CFBLNet with booster) (Storyline)**

**Story**

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

 **03.02.O01 MSG-068 NETN Concept and Reference Federation (Intended Storyline Outcome)**

**Description**

Prove that  
- MSG-068 NETN concept is feasible  
- MSG-068 NETN Reference Federation Architecture is practical

 **03.02.R01 Report about the results of Campaign 2 with Booster (Return)**

Planned Date:	03NOV2010 1100Z	State	Draft
Actual Date			
Sender	EXPCELL-ACT	Receiver	EXPCEN

**Description**

Report about the results of Campaign 2 with Booster.

 **03.02.A01 UAV Recce (Action)**

Planned Date:	03NOV2010 1239Z	State	Completed
Actual Date	03NOV2010 1239Z	Protagonist	
Duration	2h	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

The UAV Reconnaissance vignette demonstrates the use of RPR-FOM based, platform level, virtual simulation VBS2 and constructive simulation JCATS. Radio simulation is used to model communication between UAV operator and ground commander. JCATS stimulates VBS2 with entities representing the terrorist camp buildings, vehicles and individual humans. VBS2 simulates UAV and generates a UAV feed over the area including visualization of JCATS generated entities.

Fly a predator in VBS2(NLD). Initial location for the predator is 57.388402, 18.189365, 2000.

Move entities in JCATS around building1 (58.643177, 15.316343, 0) and building 2 (58.639517, 15.311118, 0)

 **03.02.I01 UAV Recce (Injection)**

Planned Date:	03NOV2010 1300Z	State	Injected
Actual Date	03NOV2010 1239Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN

Location Receiver EXPCELL-NLD, EXPCELL-ACT,

**Description**

UAV is tasked to monitor the area. JCATS entities are reflected in VBS2.

 **03.02.A02 Implement air strikes by using VBS2-NLD, VBS2-UK and JPECT** (Action)

Planned Date:	03NOV2010 1314Z	State	Completed
Actual Date		Protagonist	
Duration	15m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

Air missions flying in FLAMES strike the terrorist camp in JCATS. Select any type of aircraft and ammunition.  
UAVs in VBS2 UK and VBS2 NLD observe.  
JCATS shoots the air missions in FLAMES.

 **03.02.I02 Air Strike** (Injection)

Planned Date:	03NOV2010 1254Z	State	Injected
Actual Date	03NOV2010 1314Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT, EXPCELL-GBR, UNKNOWN,

**Description**

Air strike ordered and executed

 **03.02.I03 Air refuel** (Injection)

Planned Date:	03NOV2010 1329Z	State	Injected
Actual Date	03NOV2010 1314Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-SWE, EXPCELL-FRA,

**Description**

Start air refuel incident

 **03.02.A03 Air refuel** (Action)

Planned Date:	03NOV2010 1314Z	State	Completed
Actual Date	03NOV2010 1322Z	Protagonist	
Duration	15m	Excon Cell	EXPCELL-SWE
Location		Actors	JEMM, JEMM, JEMM,

**Description**

A request for air refule is coming from an aircraft modelled by JTLS in the south of Bogaland. A tanker aircraft in Orque offers supply service to this aircraft and the services are supplied, and both aircraft goes on their way.TYR is passive.

 **03.02.A04 Ground strike (aggregate)** (Action)

Planned Date:	03NOV2010 1356Z	State	Completed
Actual Date	03NOV2010 1356Z	Protagonist	

Duration	15m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

Terrorists are in JCATS and in the camp area.  
Aggregate units in TYR, WAGRAM and JTLS (select appropriate one from your ORBAT) engage terrorist camp.

 **03.02.I04 Ground strike 2 (Aggregated) (Injection)**

Planned Date:	03NOV2010 1329Z	State	Injected
Actual Date	03NOV2010 1356Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-SWE, EXPCELL-FRA,

**Description**

Indirect fire (platform-level)

 **03.02.I05 Marine Blocking (Injection)**

Planned Date:	03NOV2010 1411Z	State	Injected
Actual Date	03NOV2010 1412Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT,

**Description**

Marine blocking

 **03.02.A05 Marine blocking (Action)**

Planned Date:	03NOV2010 1412Z	State	Completed
Actual Date	03NOV2010 1428Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

USMC in JCATS positioned south of Terrorist Camp in Blocking position. Terrorists (both in JCATS and VBS2-NLD) moving south from the camp will be engaged by USMC.

 **03.02.I06 Hostage Situation (Injection)**

Planned Date:	03NOV2010 1427Z	State	Injected
Actual Date	03NOV2010 1429Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-SWE,

**Description**

Hostage taken and situation resolved

 **03.02.A06 Hostage situation (Action)**

Planned Date:	03NOV2010 1429Z	State	Completed
Actual Date	03NOV2010 1434Z	Protagonist	

Duration	0m	Excon Cell	EXPCELL-SWE
Location		Actors	JEMM, JEMM,

**Description**

TYR will request the transport a group of hostages held outside the terrorist camp and PitchActors will provide the transport.

 **03.02.I08 Ammunition resupply (Injection)**

Planned Date:	03NOV2010 1444Z	State	Injected
Actual Date	03NOV2010 1443Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-FRA,

**Description**

Ammunition resupply

 **03.02.A07 Repair (Action)**

Planned Date:	03NOV2010 1444Z	State	Cancelled
Actual Date		Protagonist	
Duration	15m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

JCATS request the repair of a broken down vehicle. A vehicle that needs maintenance after the ground strike.... WAGRAM provides an engineering unit supplying the service.

 **03.02.A08 Ammunition resupply (Action)**

Planned Date:	03NOV2010 1443Z	State	Completed
Actual Date	03NOV2010 1444Z	Protagonist	
Duration	15m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM,

**Description**

JCATS requests an ammunition resupply and WAGRAM provides that.

 **03.02.I07 Repair (Injection)**

Planned Date:	03NOV2010 1444Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-FRA,

**Description**

Repair logistics pattern


 **03.03 Assault Campaign 1 (CFBLNet with booster) (Storyline)**

**Story**

Terrorist Camp Assault built from vignettes - contains all vignettes


The campaign is to destroy the terrorist camp and capture the terrorists. Intel is that there is a terrorist camp, terrorist activity has happened.

The decision to attack has been taken.

 **03.03.001 Campaign 1** (*Intended Storyline Outcome*)

**Description**

Prove that  
 - MSG-068 NETN concept is feasible  
 - MSG-068 NETN Reference Federation Architecture is practical

 **03.03.R01 Report about the results of Campaign 1 with Booster** (*Return*)

Planned Date:	02NOV2010 1100Z	State	Draft
Actual Date			
Sender	EXPCELL-ACT	Receiver	EXPCEN

**Description**

Report about the results of Campaign 1 with Booster.

 **03.03.A01 Sea lift** (*Action*)

Planned Date:	03NOV2010 0745Z	State	Completed
Actual Date	03NOV2010 0745Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM, JEMM,

**Description**

Orque will provide transportation service.  
 WAGRAM will consume the service provided by Orque.  
 VR-Forces will also consume.  
 Port for embarkation is VISBY.  
 Port for debarkation is OXELÖSUND.  
 The units to be transferred will be selected by the related experimentation cell.  
 Once embarkation is complete, simulation time will be increased during transfer.  
 During transport the unit modeled in WAGRAM will be inactive. All subscribing systems shall handle the inactive state and set the new location once the service has been completed and the unit has debarked.

 **03.03.I01 Sea lift** (*Injection*)

Planned Date:	03NOV2010 0745Z	State	Injected
Actual Date	03NOV2010 0745Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-ESP, EXPCELL-FRA,

**Description**

Sea lift of forces

 **03.03.A02 UAV Recce** (*Action*)

Planned Date:	03NOV2010 0804Z	State	Completed
Actual Date	03NOV2010 0804Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-GBR
Location		Actors	JEMM, JEMM,

**Description**

The UAV Reconnaissance vignette demonstrates the use of RPR-FOM based, platform level, virtual simulation VBS2 and constructive simulation JCATS. Radio simulation is used to model communication

between UAV operator and ground commander. JCATS stimulates VBS2 with entities representing the terrorist camp buildings, vehicles and individual humans. VBS2 simulates UAV and generates a UAV feed over the area including visualization of JCATS generated entities.

Fly a predator in VBS2. Initial location for the predator is 57.388402, 18.189365, 2000.

Move entities in JCATS around building1 (58.643177, 15.316343, 0) and building 2 (58.639517, 15.311118, 0)

 **03.03.I02 UAV Recce** (*Injection*)

Planned Date:	03NOV2010 0800Z	State	Injected
Actual Date	03NOV2010 0804Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-GBR,

**Description**

UAV is tasked to monitor the area

 **03.03.I03 Cruise missile** (*Injection*)

Planned Date:	03NOV2010 0819Z	State	Injected
Actual Date	03NOV2010 0903Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT, EXPCELL-GBR, EXPCELL-FRA,

**Description**

Cruise strike ordered and executed

 **03.03.A03 Cruise missile** (*Action*)

Planned Date:	03NOV2010 0903Z	State	Completed
Actual Date	03NOV2010 0915Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

This vignette demonstrates the representation of RPR-FOM based munition objects with Weapon Fire and Munition Detonation interactions. Based on target information collected during UAV Recce and Identification, a french SCALP Naval cruise missile is launcehd from a french FREMM frigate off the coast of Bogaland. The target has been identified as a terrorist weapon depot in the northen group of buildings of the terrorist camp. Location and target parameters are reported and a fire mission communicatted using radio (PLEXcomm) to the ShipCmd. The french simulation Orque models the frigate and the cruise missile launch, flight and detonation. Effects are observed by UAV modeled using VBS2.

UAV is a predator and initial location (when the injection is given) is 57.388402, 18.189365, 2000.

The location of FREMM is 57.511, 18.055,0.

The target of SCALP is a building at location 58.643177, 15.316343, 0.

The building is an entity in JCATS.

 **03.03.A04 Ground strike** (*Action*)

Planned Date:	03NOV2010 0952Z	State	Completed
Actual Date	03NOV2010 0952Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT

Location	Actors	JEMM, JEMM, JEMM, JEMM, JEMM,
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**Description**

Multinational combined ground-strike from north of terrorist camp. Swedish MBT platoon approach from north supported by indirect fire from French 221st Motorized Infantry Battalion and mechanized infantry from US and Spain (Mech Coy: BIMZ I/31 Covadonga 3<sup>o</sup>Cia).

- FRA (Indirect Fire Support, 221BATINF 48xVBCI + 16xVAB + 8xMo120mm + 16xMilan ) at WAGRAM.
- USA (APC Stryker)at JCATS.
- ESP (AFV ASCOD PIZARRO, BIMZ I/31 Covadonga 3th Coy: 13xPizarro, 4xTruks, 84xsoldiers) at VR-Forces.
- FLAMES flies air to ground attack (CAS) and observe that with FACSIM

 **03.03.I04 Ground Strike with CAS/CCA (Injection)**

Planned Date:	03NOV2010 0918Z	State	Injected
Actual Date	03NOV2010 0952Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT, EXPCELL-GBR, EXPCELL-ESP, EXPCELL-FRA,

**Description**

Ground strike with CAS/CCA

 **03.03.A05 Marine blocking (Action)**

Planned Date:	03NOV2010 1007Z	State	Cancelled
Actual Date		Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

USMC in JCATS positioned south of Terrorist Camp in Blocking position. Terrorists (both in JCATS and VBS2-GBR) moving south from the camp will be engaged by USMC.

 **03.03.A06 MEDEVAC (Action)**

Planned Date:	03NOV2010 1007Z	State	Cancelled
Actual Date		Protagonist	
Duration	0m	Excon Cell	EXPCELL-DEU
Location		Actors	JEMM, JEMM,

**Description**

Evacuate wounded Spanish infantry in VR-Forces using Pitch Actors. The wounded soldier will be in the vicinity of the ground strike. Exact location will be determined based on the ground strike. The wounded soldier can be evacuated to any field hospital selected by EXPCELL-NLD.

 **03.03.I05 Marine Blocking Position (Injection)**

Planned Date:	03NOV2010 1007Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN

Location Receiver EXPCELL-ACT, EXPCELL-GBR,

**Description**

Marine blocking position

 **03.03.106 MEDEVAC** (*Injection*)

Planned Date: 03NOV2010 1007Z	State	Cancelled
Actual Date	Means	PLEXComm Radio
Injector EXPCEN	Coordinating Cell	EXPCEN
Location	Receiver	EXPCELL-ESP, EXPCELL-DEU,

**Description**

MEDEVAC

 **03.04 Assault Campaign 2 (Internet with booster)** (*Storyline*)

**Story**

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists. Intel is that there is a terrorist camp, terrorist activity has happened. The decision to attack has been taken.

 **03.04.O01 MSG-068 NETN Concept and Reference Federation** (*Intended Storyline Outcome*)

**Description**

Prove that  
 - MSG-068 NETN concept is feasible  
 - MSG-068 NETN Reference Federation Architecture is practical

 **03.04.A01 UAV Recce** (*Action*)

Planned Date: 02NOV2010 1300Z	State	Completed
Actual Date 02NOV2010 1300Z	Protagonist	
Duration 2h	Excon Cell	EXPCELL-ACT
Location	Actors	JEMM, JEMM,

**Description**

The UAV Reconnaissance vignette demonstrates the use of RPR-FOM based, platform level, virtual simulation VBS2 and constructive simulation JCATS. Radio simulation is used to model communication between UAV operator and ground commander. JCATS stimulates VBS2 with entities representing the terrorist camp buildings, vehicles and individual humans. VBS2 simulates UAV and generates a UAV feed over the area including visualization of JCATS generated entities.

Fly a predator in VBS2(NLD). Initial location for the predator is 57.388402, 18.189365, 2000.

Move entities in JCATS around building1 (58.643177, 15.316343, 0) and building 2 (58.639517, 15.311118, 0)

 **03.04.I01 UAV Recce** (*Injection*)

Planned Date: 02NOV2010 1300Z	State	Injected
Actual Date 02NOV2010 1300Z	Means	PLEXComm Radio
Injector EXPCEN	Coordinating Cell	EXPCEN
Location	Receiver	EXPCELL-NLD, EXPCELL-ACT,



**Description**

UAV is tasked to monitor the area. JCATS entities are reflected in VBS2.

 **03.04.A02 Implement air strikes by using VBS2-NLD, VBS2-UK and JPECT** (Action)

Planned Date:	02NOV2010 1317Z	State	Completed
Actual Date	02NOV2010 1317Z	Protagonist	
Duration	15m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

Air missions flying in JPECT strike the terrorist camp in JCATS.  
 Select any type of aircraft and ammunition. UAVs in VBS2 UK and VBS2 NLD observe.

 **03.04.I02 Air Strike** (Injection)

Planned Date:	02NOV2010 1315Z	State	Injected
Actual Date	02NOV2010 1317Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT, UNKNOWN, EXPCELL-GBR,

**Description**

Air strike ordered and executed

 **03.04.A03 Air refuel** (Action)

Planned Date:	02NOV2010 1329Z	State	Completed
Actual Date	02NOV2010 1329Z	Protagonist	
Duration	15m	Excon Cell	EXPCELL-SWE
Location		Actors	JEMM, JEMM, JEMM,

**Description**

A request for air refuel is coming from an aircraft modelled by JTLS in the south of Bogaland. A tanker aircraft in Orque offers supply service to this aircraft and the services are supplied, and both aircraft goes on their way.TYR is passive.

 **03.04.I03 Air Refuel** (Injection)

Planned Date:	02NOV2010 1332Z	State	Injected
Actual Date	02NOV2010 1329Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-SWE, EXPCELL-FRA,

**Description**

Air refuel

 **03.04.I04 Ground strike 2 (Aggregate)** (Injection)

Planned Date:	02NOV2010 1344Z	State	Injected
Actual Date	02NOV2010 1349Z	Means	E-MAIL
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-SWE,

EXPCELL-FRA,

**Description**

Ground strike (aggregate)

 **03.04.A04 Ground strike (aggregate) (Action)**

Planned Date:	02NOV2010 1349Z	State	Completed
Actual Date	02NOV2010 1353Z	Protagonist	
Duration	15m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM, JEMM, JEMM,

**Description**

Terrorists are in JCATS and in the camp area.  
Aggregate units in TYR, WAGRAM and JTLS (select appropriate one from your ORBAT) engage terrorist camp.

 **03.04.I05 Marine Blocking (Injection)**

Planned Date:	02NOV2010 1404Z	State	Injected
Actual Date	02NOV2010 1410Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-NLD, EXPCELL-ACT,

**Description**

Marine blocking

 **03.04.A05 Marine blocking (Action)**

Planned Date:	02NOV2010 1410Z	State	Completed
Actual Date	02NOV2010 1412Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-ACT
Location		Actors	JEMM, JEMM,

**Description**

USMC in JCATS positioned south of Terrorist Camp in Blocking position. Terrorists (both in JCATS and VBS2-NLD) moving south from the camp will be engaged by USMC.

 **03.04.I06 Hostage Situation (Injection)**

Planned Date:	02NOV2010 1425Z	State	Injected
Actual Date	02NOV2010 1457Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-SWE, EXPCELL-DEU,

**Description**

Hostage taken and situation resolved

 **03.04.A06 Hostage situation (Action)**

Planned Date:	02NOV2010 1457Z	State	Completed
Actual Date	02NOV2010 1500Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-DEU
Location		Actors	JEMM, JEMM,

**Description**

TYR will request the transport a group of hostages held outside the terrorist camp and Kora will provide the transport.

 **03.04.A09 MEDEVAC** (Action)

Planned Date:	02NOV2010 1508Z	State	Completed
Actual Date	02NOV2010 1508Z	Protagonist	
Duration	0m	Excon Cell	EXPCELL-DEU
Location		Actors	JEMM, JEMM,

**Description**

Evacuate wounded Spanish infantry in VR-Forces using German medevac units.in Kora. The wounded soldier will be in the vicinity of the ground strike. Exact location will be determined based on the ground strike. The wounded soldier can be evacuated to any field hospital selected by EXPCELL-DEU.

 **03.04.I07 MEDEVAC** (Injection)

Planned Date:	02NOV2010 1512Z	State	Injected
Actual Date	02NOV2010 1508Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ESP, EXPCELL-DEU,

**Description**

execute medevac injection

 **03.04.R01 Report about the results of Campaign 2 with Booster** (Return)

Planned Date:	03NOV2010 1100Z	State	Draft
Actual Date			
Sender	EXPCELL-ACT	Receiver	EXPCEN

**Description**

Report about the results of Campaign 2 with Booster.

 **03.04.I08 Ammunition resupply** (Injection)

Planned Date:	04NOV2010 1000Z	State	Injected
Actual Date	04NOV2010 1004Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	EXPCELL-ACT, EXPCELL-FRA,

**Description**

Ammunition resupply

 **03.04.A08 Ammunition resupply** (Action)

Planned Date:	04NOV2010 1004Z	State	Completed
Actual Date	04NOV2010 1005Z	Protagonist	
Duration	15m	Excon Cell	EXPCELL-FRA
Location		Actors	JEMM, JEMM,

**Description**

JCATS requests an ammunition resupply and WAGRAM provides that.



## OBSERVATION TASK REPORT

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### Storyline Observation Tasks

#### **STOR01** (Storyline Observation Task)

Observe and report the following to EXPCELL-NC3A and EXPCCEN:

- Bandwidth utilization
- Roundtrip delay
- Throughput
- Jitter

**Date** 28 Oct 2010 till 28 Oct 2010

**Training Audience:** none

**Observers:** ObserverDEU, ObserverGBR, Olsson Lennart, Peter Langeslag, Robert Forsgen, Roger Jansen, Vladimir Manda

**Observer Teams:** none

**Response Cell** EXPCELL-FRA, EXPCELL-ACT, EXPCELL-DEU, EXPCELL-GBR,

**Observers:** EXPCELL-NLD, EXPCELL-NC3A, EXPCELL-SWE

#### **01.02** Establish CFBLNet and the Internet connections (Storyline)

All nations and NATO organizations connect to CFBLNet.

##### **EO01** Secure, persistent, on-demand training capability (Primary Training Objective)

To validate MSG-068 recommendations for a secure, persistent, on-demand training capability that integrates national centres and NATO

##### **EO05** Technical standards (Secondary Training Objective)

To validate the MSG-68 recommendations for technical standards

#### **STOR02** (Storyline Observation Task)

Report the following about the CFBLNet performance throughout the experiment:

- Utilization
- Round trip delay
- Throughput
- Jitter

**Date** 28 Oct 2010 till 05 Nov 2010

**Training Audience:** EXPCELL-NC3A

**Observers:** Edgar Harsen, Vladimir Manda

**Observer Teams:** none

**Response Cell** EXPCELL-NC3A

**Observers:**

#### **01.03** Manage and monitor CFBLNet infrastructure (Storyline)

NC3A manages and monitors the CFBLNet infrastructure.

##### **EO01** Secure, persistent, on-demand training capability (Primary Training Objective)

To validate MSG-068 recommendations for a secure, persistent, on-demand training capability that integrates national centres and NATO

 Observation 59

JTLS Observe that initial joining the federation is perceived as being slower / more sluggish compared to federation join the day before. Perception is not backed by data. After join everything 'feels' normal.

CFBLNet is backbone is NGCS. Yesterdays configuration: No CFBLNet, Internet, VPN with booster.

NLVC also reported problems when joining. After joining all felt normal.

**Date:** 03 Nov 2010  
08:03:00  
**Observer:** ANALYSTTECH4  
TECHNICAL  
**Observer Role:** ANALYSIS AND  
OBSERVATION

 Observation 66

CFBLNet connection to TNO has been lost.  
Loss of connection was related to asymmetry in network performance.

Network router has been rebooted and the connection was restored, to be lost again at 09:08Z.  
Up again at 09:12Z  
Lost at 09:15Z  
09:16Z all connections lost  
09:18Z all connections back up

CFBLNet technical staff are investigating the problem

**Date:** 03 Nov 2010  
08:23:00  
**Observer:** ANALYSTTECH4  
TECHNICAL  
**Observer Role:** ANALYSIS AND  
OBSERVATION

 Observation 103

Procedures around CFBLNet connectivity are perceived as being too bureaucratic and unresponsive. There are too many documents and complicated forms involved; it takes a long time to receive reply to questions.

National POC keep changing, it is very hard to know who is the POC at any given time.

**Date:** 04 Nov 2010  
08:53:00  
**Observer:** ANALYSTTECH4  
TECHNICAL  
**Observer Role:** ANALYSIS AND  
OBSERVATION

 Observation 104

NGCS as service provider is perceived as showing slow response time.

Requests for support have taken more than one week to give an initial reply.

Feedback with actual measurements is not given.

**Date:** 04 Nov 2010  
08:56:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL  
ANALYSIS AND  
OBSERVATION

 Observation 105

During a CFBLNet switch from NGCS to VPN tunnel backbone, where physical connections between sites were lost, the booster functionality managed to keep the federation up and running; federation execution has been successfully resumed after the physical connections had been reestablished.

This was observed both with controlled and uncontrolled network interruptions.

**Date:** 04 Nov 2010  
08:59:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL  
ANALYSIS AND  
OBSERVATION

 Observation 106

CFBLNet has been used in two different configurations with regards to the underlying infrastructure: Internet and NGCS.

Latency and bandwidth data have been recorded and need to be supplied and analyzed.

As an average:

Internet latency

35 ms roundtrip time from JFTC to TNO

65 ms roundtrip time from JFTC to DSTL

110 ms roundtrip time from JFTC to Paris

Numbers have been recorded using the pingplotter software.

Internet bandwidth

2Mb/s between JFTC and DSTL

4Mb/s between JFTC and TNO

unknown for Paris (< 1Mb/s)

Numbers have been recorded using the iperf software.

NGCS latency

200 ms roundtrip time from JFTC to TNO

220 ms roundtrip time from JFTC to DSTL

300 ms roundtrip time from JFTC to Paris

Numbers have been recorded using the pingplotter software.

NGCS bandwidth

1.2Mb/s between JFTC and DSTL

2Mb/s between JFTC and TNO

unknown for Paris (< 1Mb/s)

Numbers have been recorded using the iperf software.

**Date:** 04 Nov 2010  
09:02:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL  
ANALYSIS AND  
OBSERVATION

 Observation 107

There has been no perceived overhead in terms of performance due to the extra cryptographic equipment in CFBLNet over Internet compared to the configuration using Internet only.

Detailed data have been recorded and can be analyzed afterwards.

**Date:** 04 Nov 2010  
09:10:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL  
ANALYSIS AND  
OBSERVATION

 **STOR03** (Storyline Observation Task)

Observe the technical quality of the environment.  
Prepare and hand over a questionnaire to the audience.  
Analyze and report the results of the questionnaire.

**Date:** 04 Nov 2010 till 04 Nov 2010  
**Training Audience:** C-IED Audience  
**Observers:** CIEDOBSERVER  
**Observer Teams:** none  
**Response Cell Observers:** EXPCELL-ACT

 **02.02 C-IED** (Storyline)

Two subject matter experts (SME) will be tasked by HQ-SACT and one staff officer will be tasked by JFTC for this incident. These SMEs and the staff officer will act as the trainers for a distributed C-IED training using VBS2-NATO as the training tool. Apart from that 10 trainees will be assigned by HQ-SACT. Trainers will be in EXPCELL-ACT in Bydgoszcz, and the trainees will stay in Norfolk. All the data communications will be via the Internet.

**EO06 Distributed training** (Primary Training Objective)

To validate the MSG-68 recommendations for distributed training involving national and NATO C2 and simulation systems

 **STOR04** (Storyline Observation Task)

Observe the following:

- The time required to start the federation
- Execution time (sim time real time ratio that can be achieved)
- Crashes and reasons for crashes



Prepare a questionnaire about the usefulness of the NLVC concept and federation, and ask NLVC experiment audience to complete it.

**Date:** 04 Nov 2010 till 04 Nov 2010  
**Training Audience:** NLVC Audience  
**Observers:** Clive Wood, Jaap Middelburg, NLVCSPV1, NLVCSPV2  
**Observer Teams:** none  
**Response Cell:** EXPCELL-NLD  
**Observers:**

### **02.03 NLVC-1** (Storyline)

Forward observers located in JFTC (EXPCELL-ACT) and using FACSIM FAC station controls air mission (air to ground attack) that fly in FACSIM (F16). FLAMES (F18) in JFTC (EXPCELL-ACT controlled) fly combat air patrol. 3 VBS2-VTK UAVs observe village (1 X GBR @ DSTL, 1 X NLD @ TNO, 1 X JWC UAV but controlled from JFTC). Targets are armed vehicles in the village and any escaping vehicles. The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

#### **EO06 Distributed training** (Primary Training Objective)

To validate the MSG-68 recommendations for distributed training involving national and NATO C2 and simulation systems

#### **EO05 Technical standards** (Secondary Training Objective)

To validate the MSG-68 recommendations for technical standards

#### **EO04 Multi-granularity** (Secondary Training Objective)

To validate the MSG-68 recommendations for multi-granularity

### Observation 2

Federation started in 2 min 35 sec.

**Date:** 29 Oct 2010 11:52:00  
**Observer:** CAYIRCIE  
**Observer Role:** CHIEF EXPCEN

### Observation 124

VBS2 NATO crashed when vehicle got destroyed.

**Date:** 04 Nov 2010 13:42:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL OBSERVATION AND ANALYSIS

### Observation 125

VBS2 crash during NLVC game. Aircraft fired on vehicle.

lines from VBS2 LVC Error log

```
[LVCGame] 11/04/10 12:39:08 ERROR  
(HLA1516E::RPR_COMMON::AntennaPatternStruct::unmarshal) **BufferUnderrun**  
AntennaPatternStruct expects 4 bytes, found 0  
[LVCGame] 11/04/10 12:39:08 ERROR  
(HLA1516E::RPR_COMMON::AntennaPatternStruct::unmarshal) **BufferUnderrun**
```

AntennaPatternStruct expects 4 bytes, found 0  
[LVCGame] 11/04/10 12:40:36 WARNING (LVCGame\_API::entityCreated) VBS->LVC No mappings found for entity type '#destructioneffects'  
[LVCGame] 11/04/10 12:40:36 WARNING (LVCGame\_API::entityCreated) VBS->LVC No mappings found for entity type '#objectdestroyed'  
[LVCGame] 11/04/10 12:51:31 WARNING (LVCGame\_API::entityCreated) VBS->LVC No mappings found for entity type '#destructioneffects'  
[LVCGame] 11/04/10 12:51:31 WARNING (LVCGame\_API::entityCreated) VBS->LVC No mappings found for entity type '#objectdestroyed'  
[LVCGame] 11/04/10 12:52:03 INFO (HLA1516E::HLAManager::resign) Resigning from federation...  
[LVCGame] 11/04/10 12:52:03 INFO (HLA1516E::HLAManager::resign) Resigned from federation!

**Date:** 04 Nov 2010 14:53:00  
**Observer:** BROWNA  
**Observer Role:** JEMM ADMIN

 Observation 126

NLVC federation observation.

Vehicles disappearing in VBS2.

HLA config change:

hla1516e.deleteTimeout = 6000

changed to

hla1516e.deleteTimeout = 0

This is the time in milliseconds to wait for updates from a remote entity before it automatically gets deleted. zero turns this off.

**Date:** 04 Nov 2010 14:57:00  
**Observer:** BROWNA  
**Observer Role:** JEMM ADMIN

 **STOR05** (Storyline Observation Task)

Report about both the following technical and operational issues:

Technical:


- The time required to start the experiment
- The execution speed (the simulation time to real time ratio that can be achieved)
- The overhead of federating instead of running the same scenario at a single simulation

Operational

- The realism
- The training value

**Date:** 04 Nov 2010 till 04 Nov 2010  
**Training Audience:** Logistics Audience  
**Observers:** ObserverDEU  
**Observer Teams:** none

**Response Cell Observers:** EXPCELL-ESP, EXPCELL-ACT, EXPCELL-DEU

 **02.01 Logistics (MEDEVAC) (Storyline)**

Two troops modeled in VR-Forces by EXPCELL-ESP are wounded. A medical evacuation plan is developed by the operational people in EXPCELL-ACT send their plan to MEDEVAC response cell in EXPCELL-DEU. Then EXPCELL-DEU implements this plan in KORA to evacuate the wounded troops modelled in VR-Forces. All incident is also observed in the other models (i.e., JCATS, JTLS, TYR, VBS2).

**EO06 Distributed training (Primary Training Objective)**

To validate the MSG-68 recommendations for distributed training involving national and NATO C2 and simulation systems

**EO03 Distributed simulation integrating NATO and national M&S capabilities (Secondary Training Objective)**


To validate MSG-068 recommendations for distributed simulation integrating NATO and national M&S capabilities

 **STOR06 (Storyline Observation Task)**

Observe and report the following:

- Orque can provide and WAGRAM can consume Convoy service
- Orque can provide and VR-Forces consume Convoy service
- JTLS NETN surface vessels are reflected in Orque
- VR-Forces aggregate units are reflected in WAGRAM and JTLS
- WAGRAM units are reflected in VR-Forces
- JTLS units are reflected in VR-Forces
- Orque units are reflected in JTLS

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Ellen Roland, Enrique Banales, Jose Ruiz  
**Observer Teams:** none  
**Response Cell Observers:** EXPCELL-ESP, EXPCELL-FRA, EXPCELL-ACT

 **03.01 Assault Campaign 1 (Internet with booster) (Storyline)**

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists. Intel is that there is a terrorist camp, terrorist activity has happened. The decision to attack has been taken.

**EO05 Technical standards (Primary Training Objective)**

To validate the MSG-68 recommendations for technical standards

 **03.01.101 Sea lift (Injection)**

Planned Date:	02NOV2010 0858Z	State	Injected
Actual Date	02NOV2010 0856Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Sea lift of forces

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start sea lift.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*



Observation 5

JTLS observe that the federation is locked up and we don't know if the issue is being addressed.

**Date:** 02 Nov 2010 08:04:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL OBSERVATION AND ANALYSIS



Observation 6

JTLS observe that there are JTLS units and ships published but there is no action for them. Consulted with EXPCEN/Erdal and the guidance is that in Campaign 1 there is no activity, but there can be some in the other campaigns.

**Date:** 02 Nov 2010 08:05:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL OBSERVATION AND ANALYSIS



Observation 8

JTLS HLA component (HIP) came down while decoding an entity for an ASCII dump

**Date:** 02 Nov 2010 09:00:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL OBSERVATION AND ANALYSIS



Observation 21

The first attempt was not successful. Not all the federates managed to join. After changing the order (JTLS, Alligator, VR-Forces) the federation got going.

**Date:** 02 Nov 2010 10:31:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS



Observation 116

Remark 1 : ORQUE received a Convoy request from WAGRAM  
Provider is "MISTRAL" and Consumer is "244EEI"

Remark 2 : Some incompatibilities between ALLIGATOR and VRFORCE are noticed. Request can't be achieved.  
Some local test were needed to continue the incident "Sealift".

Remark 3 : Aircraft and surface vessel from JTLS were reflected in ORQUE and WAGRAM

Remark 4 : Aggregate units from VRFORCE were not reflected in ORQUE and ORQUE

**Date:** 04 Nov 2010 10:49:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN  
EXPCELL-FRA

 **STOR07** (Storyline Observation Task)

Repeat STOR6. Is there any difference comparing to your observations during STOR6. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Ellen Roland, Enrique Banales, Jose Ruiz  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-ESP, EXPCELL-FRA, EXPCELL-ACT

 **03.03 Assault Campaign 1 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.03.101 Sea lift** (Injection)

Planned Date:	03NOV2010 0745Z	State	Injected
Actual Date	03NOV2010 0745Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Sea lift of forces

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start sea lift.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 58

PLEXCOMM was not set with correct parameters, operators were transmitting on the wrong frequencies. Likely due to missing training

**Date:** 03 Nov 2010 08:00:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 70

JTLS successfully published 3 ships.  
JTLS reflected VR-Forces and ORQUE units.  
JTLS air missions successfully published and reflected in GE Adapter.

**Date:** 03 Nov 2010 09:53:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL OBSERVATION AND ANALYSIS

 Observation 71

Air mission have to have pre-defined names to be recognized in the federation. There is no flexibility.

**Date:** 03 Nov 2010 09:57:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL OBSERVATION AND ANALYSIS

 Observation 76

Position of VR-Forces entities (namely Sea lift convoy) seemed to be in a different location than the one planned for the injection.

**Date:** 03 Nov 2010 12:26:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 118

Remark 1 : ORQUE received a Convoy request and acheive Transport with WAGRAM  
Provider is "MISTRAL" and Consumer is "244EEI"

Remark 2 : ORQUE received a Convoy request and negotiate the offer with VRFORCE  
Provider is "TONNERRE" and Consumer is "BIMZ31/I/3Coy"  
Moving of "BIMZ31/I/3Coy" to the point of On Board is to long to acheive Transport.

Remark 3 : Aircraft and surface vessel from JTLS were reflected in ORQUE and WAGRAM

Remark 4 : Aggregate units from VRFORCE were reflected in ORQUE.

**Date:** 04 Nov 2010 10:53:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA


 **STOR08** (Storyline Observation Task)

Oserve the following:

- JCATS entities are reflected in VBS2-UK
- VBS2-UK entities are reflected in JCATS

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, ObserverGBR  
**Observer Teams:** none  
**Response Cell:** EXPCELL-ACT, EXPCELL-GBR

**Observers:**

 **03.01 Assault Campaign 1 (Internet with booster) (Storyline)**

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards (Primary Training Objective)**

To validate the MSG-68 recommendations for technical standards

 **03.01.102 UAV Recce (Injection)**

Planned Date:	02NOV2010 0911Z	State	Injected
Actual Date	02NOV2010 0909Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

UAV is tasked to monitor the area

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start the UAV mission.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 10

2 different UAVs managed by 2 different VBS2 (TNO & UK) flying together and seeing each other in a single federation

<b>Date:</b>	02 Nov 2010 09:26:00
<b>Observer:</b>	CHIEFANALYST
<b>Observer Role:</b>	CHIEF ANALYST AND OBSERVER

 Observation 23

JCATS managed to properly reflect the UAVs updated by VBS2.  
One of the objects in JCATS (a plain terrorist) could not be presented and shown properly because of a mapping problem in JCATS


<b>Date:</b>	02 Nov 2010 10:34:00
<b>Observer:</b>	ANALYSTTECH2
<b>Observer Role:</b>	TECHNICAL ANALYSIS

 Observation 64

VBS2 UAV operator was able to see the entities produced by JCATS and to identify 9 vehicles, (represented as pick-up trucks, Jeeps and small vans).  
Some were tracked moving around the camp. Some remained stationary.  
The moving vehicles stayed on or near the roads in the VBS2 terrain.  
Frame rates were good


<b>Date:</b>	02 Nov 2010 09:30:00
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**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 **STOR09** (Storyline Observation Task)

Repeat STOR8. Is there any difference comparing to your observations during STOR8. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date:** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, ObserverGBR  
**Observer Teams:** none  
**Response Cell Observers:** EXPCELL-ACT, EXPCELL-GBR

 **03.03 Assault Campaign 1 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.03.102 UAV Recce** (Injection)

Planned Date:	03NOV2010 0800Z	State	Injected
Actual Date	03NOV2010 0804Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

UAV is tasked to monitor the area

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start the UAV mission.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 62

JCATS Entities experimented unplanned firing against flying objects during the injection (VBS2 UK controlled UAV)

**Date:** 03 Nov 2010 08:22:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 63

VBS2 UK were able to see JCATS entities - Cultural features, platforms and lifeforms.  
Frame rate was good. Platforms and lifeforms seen to move at reasonable speeds.



JCATS fire and detonations NOT seen in VBS2. Possible enumeration mapping issue - we will investigate

**Date:** 03 Nov 2010 09:02:00  
**Observer:** OBSERVERGBR  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-GBR

 Observation 69

VBS2-UK entities are reflected in JCATS as planned

**Date:** 03 Nov 2010 09:45:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 74

JCATS tried to shoot down a UAV, but did not manage (munition mapping problem)


**Date:** 03 Nov 2010 10:47:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 **STOR10** (Storyline Observation Task)

Observe the following:

- Orque munition objects are reflected in JCATS
- Orque munition detonations are reflected in JCATS, VBS2-UK and VBS2-NLD
- JCATS updates of damage state of cultural features, platforms and life forms are reflected in VBS2
- VBS2-UK and VBS2-NLD entities are reflected in JCATS and Orque
- JCATS entities are reflected in VBS2-NLD and VBS2-UK

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Jose Ruiz, ObserverGBR, Roger Jansen  
**Observer Teams:** none  
**Response Cell Observers:** EXPCELL-FRA, EXPCELL-ACT, EXPCELL-GBR, EXPCELL-NLD

 **03.01 Assault Campaign 1 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.01.103 Cruise missile** (Injection)

Planned Date:	02NOV2010 0924Z	State	Injected
Actual Date	02NOV2010 0923Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating	EXPCEN

Location

Cell  
Receiver

**Description**

Cruise strike ordered and executed

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start cruise missile strike

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 11

Orque to speed up the simulation by 5 times

**Date:** 02 Nov 2010 09:33:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER


 Observation 61

no detonations and no damage to entities shown in the interface- either from VBS2 or JCATS

**Date:** 02 Nov 2010 09:43:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 13

VBS2-NLD saw a ground vehicle speeding around the area.

In the beginning of the vignette there all of a sudden was a burning vehicle in the urban area.

VBS2-NLD UAV/camera seemed to lag a lot, jumping all over the area. When Alligator left the federation it was very smooth again.

**Date:** 02 Nov 2010 09:43:00

**Observer:** ANALYSTTECH

**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 60

VBS2 UK UAV operator was able to see the entities produced by JCATS.

Also able to identify 9 vehicles, (represented as pick-up trucks, Jeeps and small vans).

Some were tracked moving around the camp. Some remained stationary.

The moving vehicles stayed on or near the roads in the VBS2 terrain.

2 buildings from JCATS also received.

There were 4 dismounted terrorists spotted also - these were moving at an appropriate speed.

No issues with simulation speed.

**Date:** 02 Nov 2010 09:05:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 17

JCATS did not reflect the missile object and was not able to adjudicate damage against the building; both issues are due to lack of data mapping in JCATS. This has been corrected for subsequent testing.

**Date:** 02 Nov 2010 10:07:00  
**Observer:** OBSERVERUSA  
**Observer Role:** OT

 Observation 22

When ORQUE joined VBS2 UK lost simulation speed and dropped to a very slow frame rate. JCATS entities - platforms and lifeforms and cultural features all appeared in VBS2

No visible detonations, no damaged entities observed or recorded in our entity state viewer from the detonation event.

There was 1 damaged entity identified, a UAV HERTI.13 which was from the TNO VBS2 Cell, - but we think it ran out of fuel.

This appeared as a K-Killed unit and was grounded.

**Date:** 02 Nov 2010 10:36:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 25

Munition objects are not reflected in JCATS  
Munition detonations are not reflected in JCATS  
A UAV (VBS2-NLD) is reflected, but not moving  
Missiles and detonations are not mapped in JCATS

**Date:** 02 Nov 2010 10:37:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 115

Remark 1 : mobile Platform from JCATS and VBS2 are reflect in ORQUE.

Remark 2 : Missile use for ORQUE fire is : 2.9.71.1.8.0.0

**Date:** 04 Nov 2010 10:48:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR11** (Storyline Observation Task)

Repeat STOR10. Is there any difference comparing to your observations during STOR10. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date:** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Jose Ruiz, ObserverGBR, Roger Jansen

**Observer Teams:** none  
**Response Cell Observers:** EXPCELL-FRA, EXPCELL-ACT, EXPCELL-GBR, EXPCELL-NLD

 **03.03 Assault Campaign 1 (CFBLNet with booster)** *(Storyline)*

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** *(Primary Training Objective)*

To validate the MSG-68 recommendations for technical standards

 **03.03.103 Cruise missile** *(Injection)*

Planned Date:	03NOV2010 0819Z	State	Injected
Actual Date	03NOV2010 0903Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Cruise strike ordered and executed

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start cruise missile strike

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 3

test

**Date:** 01 Nov 2010 12:59:00

**Observer:** browna

**Observer Role:** JEMM admin


 Observation 4

fghfghfghgf

**Date:** 01 Nov 2010 13:00:00

**Observer:** browna

**Observer Role:** JEMM admin

 Observation 12

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**Date:** 02 Nov 2010 09:43:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 15

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**Date:** 02 Nov 2010 09:59:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER



Observation 65

CFBLNet went down for line issues. When stood up again, the federation was still up and running

**Date:** 03 Nov 2010 09:32:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER



Observation 67

VBS2-NLD reflected ground units, a winged UAV and a helicopter.  
Munitions, munition detonations and damage status changes were not visible in VBS2-NLD.

**Date:** 03 Nov 2010 09:39:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES



Observation 68

Munition objects are not reflected in JCATS  
Munition detonations are not reflected in JCATS  
UAVs (VBS2-NLD, VBS2-UK and VBS2-JWC) are reflected in JCATS  
Missiles and detonations are not mapped in JCATS

**Date:** 03 Nov 2010 09:43:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS



Observation 72

VBS2 was able to see JCATS entities: cultural features, platforms and lifeforms.  
Cruise missile was logged and detonations received but NOT visualised.  
No damaged entities recorded. No change in damage states of JCATS entities.  
Frame rate was reduced from earlier vignette (UAV recee)

**Date:** 03 Nov 2010 10:17:00  
**Observer:** OBSERVERGBR  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-GBR




Observation 120

Remark 1 : mobile Plateform from JCATS and VBS2 are reflect in ORQUE.

Remark 2 : Missile use for ORQUE fire is : 2.9.71.1.8.0.0

**Date:** 04 Nov 2010 10:53:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR12** (Storyline Observation Task)

Observe the following:

- WAGRAM indirect fire munition detonations are reflected in JCATS, VR-Forces, VBS2-UK, VBS2-NLD and FLAMES
- VR-Forces platforms are reflected in VBS2-UK, VBS2-NLD and FLAMES
- JCATS entities/units are reflected in WAGRAM, VR-Forces, VBS2-NLD, VBS2-UK and FLAMES
- VR-Forces direct fire and munition detonation is reflected in WAGRAM, JCATS, VBS2 and FLAMES
- JCATS updates of damage state of cultural features, platforms and live forms are reflected in VBS2, VR-Forces and FLAMES
- VR-Forces aggregate units are reflected in JCATS, WAGRAM and FLAMES
- VBS2-UK fire and detonations are reflected in VR-Forces and FLAMES
- VR-Forces updates of damage state is reflected in VBS2-UK and FLAMES
- FLAMES entities/units are reflected in WAGRAM, VR-Forces, VBS2-NLD, VBS2-UK and JCATS
- FLAMES fires/detonations are reflected in WAGRAM, VR-Forces, VBS2-NLD, VBS2-UK and JCATS
- FLAMES updates of damage state of cultural features, platforms and life forms are reflected in VR-Forces, VBS2-NLD, VBS2-UK and JCATS

**Date** 02 Nov 2010 till 02 Nov 2010


**Training Audience:** none

**Observers:** Andy Brown, Enrique Banales, Jose Ruiz, ObserverGBR, Roger Jansen, Clive Wood

**Observer Teams:** none

**Response Cell** EXPCELL-ESP, EXPCELL-FRA, EXPCELL-ACT, EXPCELL-GBR,

**Observers:** EXPCELL-NLD

 **03.01 Assault Campaign 1 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.

Intel is that there is a terrorist camp, terrorist activity has happened.

The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.01.104 Ground Strike with CAS/CCA** (Injection)

Planned Date:	02NOV2010 0938Z	State	Injected
Actual Date	02NOV2010 0936Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Ground strike with CAS/CCA

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start the ground strike with CAS/CCA

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 54


VBS2 UK & NLD controlled UAVs crashed while flying in the same federation

**Date:** 02 Nov 2010 10:00:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 18

JCATS again has difficulty joining the federation.

**Date:** 02 Nov 2010 10:11:00  
**Observer:** OBSERVERUSA  
**Observer Role:** OT

 Observation 55

After its detonation, munition object generated by FLAMES didn't move away from federation

**Date:** 02 Nov 2010 10:15:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 20

VBS2-NLD received entities and airstrike detonations but no indirect fire.

**Date:** 02 Nov 2010 10:24:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 24

VBS2 UK initially was joined to the federation. Frame rate slowed and then the simulation froze. Unable to rejoin the federation after restarting and did not participate in the injection.

**Date:** 02 Nov 2010 10:38:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 26

JCATS had problems connecting to the federation. It was resigned from the federation and had to restart.

Bombs are not removed after detonation are still shown by JCATS.

VR-Forces direct fire and detonations are reflected by JCATS.

VR-Forces aggregate units are not reflected in JCATS.

FLAMES entities are reflected in JCATS.

FLAMES detonations are reflected in JCATS.

**Date:** 02 Nov 2010 10:57:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 28

See comments in STOR21 - We did not federate with WAGRAM

FLAMES did not see VBS2-UK detonations but did see the effect of the air to air collision

**Date:** 02 Nov 2010 11:08:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 Observation 29

JCATS entities reflected in FLAMES  
VBS2-UK entities reflected in FLAMES  
VBS2-NL entities reflected in FLAMES  
FLAMES detonations were reflected in JCATS  
FLAMES detonations were reflected in VBS-2NL  
VBS2-UK crashed just before the air strike  
UAV piloted by VBS2-UK crashed into the UAV piloted by VBS2-NL  
VJCATS entities reflected in NLVC Stealth View and NLVC Plan View Display  
VBS2-UK entities reflected in NLVC Stealth View and NLVC Plan View Display  
VBS2-NL entities reflected in NLVC Stealth View and NLVC Plan View Display  
FLAMES detonations were reflected in NLVC Stealth View and NLVC Plan View Display  
FLAMES detonations were reflected in NLVC Stealth View and NLVC Plan View Display  
VR-FORCES entities were reflected in NLVC Stealth View and NLVC Plan View Display.  
However one of the VR-FORCES entities was positioned on top of a tree.  
VR-FORCES detonations (direct fire) were reflected in NLVC Stealth View and NLVC Plan View Display

During the execution there seemed to be a problem when FACSIM (using DIS) joined the federation through a Gateway - FLAMES received unexpected UDP traffic and eventually crashed.

Since the test FACSIM has joined the federation through the gateway as expected with no additional UDP traffic.

NOTE: for the FAC Vignette on Thursday the PlexComm radios need to be on the same Federation as the FACSIM, VBS-2 NL, FLAMES etc as there is a requirement to communicate to the ASTi Radios (DIS) at TNO and JFTC.

**Date:** 02 Nov 2010 11:11:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 Observation 30

JCATS was unable to process some of the VRForces MunitionDetonation Interactions due to use of non-ORBAT munition type, e.g. FiringObjectIdentifier: VRF24:129, munitiontype=2.2.225.2.1.1.0

**Date:** 02 Nov 2010 11:31:00  
**Observer:** OBSERVERUSA  
**Observer Role:** OT

 Observation 31

Flames updates of damages are reflected in JCATS

**Date:** 02 Nov 2010 12:07:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS



 Observation 114

Remark 1 : Aggregate units and Aircraft from all simulation were reflected in WAGRAM.

Remark 2 : Munition use for WAGRAM fire is : 2.9.205.2.11.0.0

**Date:** 04 Nov 2010 10:48:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR13** (Storyline Observation Task)

Repeat STOR12. Is there any difference comparing to your observations during STOR12. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date:** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Enrique Banales, Jose Ruiz, ObserverGBR, Roger Jansen  
**Observer Teams:** none  
**Response Cell:** EXPCELL-ESP, EXPCELL-FRA, EXPCELL-ACT, EXPCELL-GBR,  
**Observers:** EXPCELL-NLD

 **03.03 Assault Campaign 1 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.03.104 Ground Strike with CAS/CCA** (Injection)

Planned Date:	03NOV2010 0918Z	State	Injected
Actual Date	03NOV2010 0952Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Ground strike with CAS/CCA

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start the ground strike with CAS/CCA

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 16

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**Date:** 02 Nov 2010 10:00:00  
**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 19


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**Date:** 02 Nov 2010 10:15:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 33

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**Date:** 02 Nov 2010 13:25:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 42

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**Date:** 02 Nov 2010 14:06:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 73

VBS2-NLD received one kind of detonations and damage status updates on entities. Operator of VBS2-NLD could not tell for certain if it was WAGRAMs indirect fire or VR-forces direct fire that caused the detonations, but the operator thinks it is one detonation missing.

**Date:** 03 Nov 2010 10:21:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 75

WAGRAM indirect fire was not reflected in JCATS  
VR-Forces direct fire and munition detonation were reflected in JCATS  
FLAMES entities/fire and detonations/updates of damage were reflected in JCATS

**Date:** 03 Nov 2010 10:49:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 119

Remark 1 : Aggregate units and Aircraft from all simulation were reflected in WAGRAM.

Remark 2 : Munition use for WAGRAM fire is : 2.9.205.2.11.0.0


**Date:** 04 Nov 2010 10:53:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR14** (Storyline Observation Task)

Observe the following:

- VBS2-UK platform and life form are reflected in JCATS
- JCATS platforms and munition detonations are reflected in VBS2-UK
- VBS2-UK damage states are reflected in JCATS

**Date** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, ObserverGBR  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-ACT, EXPCELL-GBR

 **03.01 Assault Campaign 1 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.01.105 Marine Blocking Position** (Injection)

Planned Date:	02NOV2010 0951Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Marine blocking position

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

START MARINE BLOCKING POSITION

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 **STOR15** (Storyline Observation Task)

Repeat STOR15. Is there any difference comparing to your observations during STOR15. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, ObserverGBR  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-ACT, EXPCELL-GBR

 **03.03 Assault Campaign 1 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.03.105 Marine Blocking Position** (Injection)

Planned Date:	03NOV2010 1007Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Marine blocking position

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

START MARINE BLOCKING POSITION


\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 **STOR16** (Storyline Observation Task)

Observe the following:

- KORA can provide and VR-Forces consume convoy pattern
- VR-Forces entities are reflected in Kora
- VR-Forces aggregate units are reflected in KORA
- KORA entities are reflected in VR-Forces
- KORA aggregate units are reflected in VR-Forces

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Enrique Banales, ObserverDEU  
**Observer Teams:** none  
**Response Cell:** EXPCELL-ESP, EXPCELL-DEU  
**Observers:**

 **03.01 Assault Campaign 1 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.01.106 MEDEVAC** (Injection)

Planned Date:	02NOV2010 0951Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN

Location	Cell
	Receiver
<b>Description</b>	
MEDEVAC	
<b>Functional Area Message</b>	
*** EXERCISE *** EXERCISE *** EXERCISE ***	
Start MEDEVAC	
*** EXERCISE *** EXERCISE *** EXERCISE ***	

 **STOR17** (Storyline Observation Task)

Observe the following:

- PitchActors can provide and VR-Forces consume convoy pattern
- VR-Forces entities are reflected in PitchActors
- VR-Forces aggregate units are reflected in PitchActors
- PitchActor entities are reflected in VR-Forces
- PitchActor aggregate units are reflected in VR-Forces

**Date** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Enrique Banales, Olsson Lennart  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-ESP, EXPCELL-NLD

 **03.03 Assault Campaign 1 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.03.106 MEDEVAC** (Injection)

Planned Date:	03NOV2010 1007Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**  
 MEDEVAC  
**Functional Area Message**  
 \*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*  
 Start MEDEVAC  
 \*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 **STOR18** (Storyline Observation Task)

Observe the following:

- JCATS entities are reflected in VBS2-NLD
- VBS2-NLD entities are reflected in JCATS

**Date** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Roger Jansen  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-ACT, EXPCELL-NLD

 **03.02 Assault Campaign 2 (CFBLNet with booster) (Storyline)**

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists. Intel is that there is a terrorist camp, terrorist activity has happened. The decision to attack has been taken.

**EO05 Technical standards (Primary Training Objective)**

To validate the MSG-68 recommendations for technical standards

 **03.02.101 UAV Recce (Injection)**

Planned Date:	03NOV2010 1300Z	State	Injected
Actual Date	03NOV2010 1239Z	Means	PLEXComm Radio
Injector	EXPEN	Coordinating Cell	EXPEN
Location		Receiver	

**Description**

UAV is tasked to monitor the area. JCATS entities are reflected in VBS2.

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start the UAV recce, and inform the other experiment cells.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 80

VBS2-NLD are receiving the JCATS entities.

**Date:** 03 Nov 2010 12:36:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 77

unplanned firing by JCATS entities was not reflected into VBS2 NLD. Neither detonations were observed

**Date:** 03 Nov 2010 12:45:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 81

JCATS is able to reflect entities from the other federates  
JWC has dropped out. JWC restarts again  
JCATS shoots at the UAVs but no reaction is seen (munition mapping problem)

**Date:** 03 Nov 2010 13:18:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 87


VBS2:- A UAV operator has the possibility to choose another UAV from a different federated VBS2 model using the control link mechanism in VBS2. Co-ordination is required to see if he has the ability to control the UAV.

**Date:** 03 Nov 2010 13:51:00  
**Observer:** BROWNA  
**Observer Role:** JEMM ADMIN

 **STOR19** (Storyline Observation Task)

Observe the following:  
- JCATS entities are reflected in VBS2-NLD  
- VBS2-NLD entities are reflected in JCATS

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Roger Jansen  
**Observer Teams:** none  
**Response Cell:** EXPCELL-ACT, EXPCELL-NLD  
**Observers:**

 **03.04 Assault Campaign 2 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.


**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 Observation 36

VBS2-NLD received entities, but no detonation or detonations were in the wrong location.

**Date:** 02 Nov 2010  
13:53:00  
**Observer:** ANALYSTTECH  
OBSERVATION  
AND AALYSIS  
**Observer Role:** CHIEF FOR TECH  
ISSUES

 Observation 47

VBS2-NLD entities are reflected in JCATS as planned

**Date:**

02 Nov 2010  
14:47:00

**Observer:**

ANALYSTTECH2

**Observer Role:**

TECHNICAL  
ANALYSIS

 Observation 52

We need a federation agreement for understanding when an aircraft is flying. A convention I have seen in other federations is setting the PowerPlantOn attribute of BaseEntity.PhysicalEntity to True when an aircraft object is flying. When the aircraft lands, the PowerPlantOn attribute is changed to False. This doesn't have to be the agreement for this federation, e.g. we can agree on a minimum velocity which constitutes flight, etc., but we should agree on something.

**Date:**

02 Nov 2010  
15:05:00

**Observer:**

OBSERVERUSA

**Observer Role:**

OT

 **STOR20** (*Storyline Observation Task*)

Observe the following:

- JCATS entities are reflected in JPECT, VBS2-NLD and VBS2-UK
- JPECT munition objects are reflected in JCATS
- JPECT detonations are reflected in VBS2-UK and VBS2-NLD
- JPECT munition detonations are reflected in JCATS
- JCATS updates of damage state of cultural features, platforms and life-forms are reflected in VBS2-UK, VBS2-NLD and JPECT

Is there any difference comparing to your observations during STOR21. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date** 03 Nov 2010 till 03 Nov 2010

**Training Audience:** none

**Observers:** Andy Brown, Clive Wood, ObserverGBR, Roger Jansen

**Observer Teams:** none

**Response Cell** EXPCELL-ACT, EXPCELL-GBR, EXPCELL-NLD

**Observers:**

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (*Storyline*)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists. Intel is that there is a terrorist camp, terrorist activity has happened. The decision to attack has been taken.

**EO05 Technical standards** (*Primary Training Objective*)

To validate the MSG-68 recommendations for technical standards



 **03.02.102 Air Strike (Injection)**

Planned Date:	03NOV2010 1254Z	State	Injected
Actual Date	03NOV2010 1314Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Air strike ordered and executed

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start air strike.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 79

Flames entities performed air strike. VBS2 TNO saw multiple detonations, VBS2 UK saw no detonations but reported number of craters and damaged vehicles.

FLAMES saw no detonations on the ground.

JCATS entities fired at both FLAMES and VBS2 ENTITIES, no effects for them.

<b>Date:</b>	03 Nov 2010 13:10:00
<b>Observer:</b>	CHIEFANALYST
<b>Observer Role:</b>	CHIEF ANALYST AND OBSERVER

 Observation 82

JCATS entities seen in VBS2; cultural features, platforms and lifeforms.

FLAMES detonations were seen in VBS2 and recorded in the VBS2 log. A number of the munitions dropped by FLAMES were not deleted after the detonation event and were persisting in the federation as K-killed entities in the VBS2 log.

VBS2 saw damage states of K-KILL for JCATS platforms and lifeforms. These were visualised in VBS2 correctly.

<b>Date:</b>	03 Nov 2010 13:19:00
<b>Observer:</b>	OBSERVERGBR
<b>Observer Role:</b>	OBSERVER AND ANALYST IN EXPCCELL-GBR

 Observation 83

JCATS entities are reflected in Flames, VBS2-NLD and VBS2-UK, VBS2-JWC

Flames munition objects are reflected in JCATS

Flames munition detonations are reflected in JCATS

JCATS updates of damage state of cultural features, platforms and life-forms are reflected in VBS2-UK, VBS2-NLD Flamse and VBS2-JWC

JCATS shoots at the VBS2-UK UAV, and Flames federate crashes

JCATS is planning to shoot at planes updated by FLAMES. Planes are too fast and JCATS doesn't manage to react and shoot at the planes

<b>Date:</b>	03 Nov 2010 13:20:00
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**Observer:**  
**Observer Role:**

ANALYSTTECH2  
TECHNICAL ANALYSIS

 Observation 90

JCATS firing with MANPAD on FLAMES aircraft (late insertion in the scenario) was not observed in FLAMES, MaK stealth and NLVC Plan View Display.

**Date:** 03 Nov 2010 14:32:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 Observation 92

JCATS entities were observed in NLVC PVD  
JCATS updates were observed in NLVC PVD  
VBS2 entities were observed in NLVC PVD


**Date:** 03 Nov 2010 14:38:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 **STOR21** (*Storyline Observation Task*)

Observe the following:

- JCATS entities are reflected in JPECT, VBS2-NLD and VBS2-UK
- JPECT munition objects are reflected in JCATS
- JPECT detonations are reflected in VBS2-UK and VBS2-NLD
- JPECT munition detonations are reflected in JCATS
- JCATS updates of damage state of cultural features, platforms and life-forms are reflected in VBS2-UK, VBS2-NLD and JPECT

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Clive Wood, ObserverGBR, Roger Jansen  
**Observer Teams:** none  
**Response Cell:** EXPCELL-ACT, EXPCELL-GBR, EXPCELL-NLD  
**Observers:**

 **03.04 Assault Campaign 2 (Internet with booster)** (*Storyline*)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (*Primary Training Objective*)

To validate the MSG-68 recommendations for technical standards

 **03.04.102 Air Strike** (*Injection*)

Planned Date:	02NOV2010 1315Z	State	Injected
Actual Date	02NOV2010 1317Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating	EXPCEN

Location

Cell  
Receiver

**Description**

Air strike ordered and executed

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start air strike.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 27

\*\*\*TO BE DELETED\*\*\*\*\*

**Date:** 02 Nov 2010 10:51:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 Observation 32

VBS2 UK UAV pc crash, will not rejoin after reboot

**Date:** 02 Nov 2010 13:22:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 56

VBS2 NLD didn't see FLAMES detonations

**Date:** 02 Nov 2010 13:25:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 43

FLAMES reflected JCATS entities  
NLVC Stealth / NLVC Plan View Display refelectd JCATS entities  
FLAMES/ NLVC Stealth/ NLVC Plan View Display - reflected VBS2-NLD entites  
VBS2-UK crashed at start and did not rejoin  
NLVC Stealth and NLVC Plan View Display reflected detonation  
VBS2-NLD did not reflect the detonation (as reported by radio)

**Date:** 02 Nov 2010 13:45:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 Observation 48

Flames munition objects and detonations are reflected in JCATS  
VBS2-Uk crashed

**Date:** 02 Nov 2010 14:48:00  
**Observer:** ANALYSTTECH2

**Observer Role:** TECHNICAL ANALYSIS

 **STOR22** (Storyline Observation Task)

Observe the following:

- Orque can provide and JTLS can consume supply service
- Orque entities are reflected in JTLS
- JTLS entities are reflected in Orque
- JTLS aggregate units are reflected in TYR
- TYR aggregate units are reflected in JTLS

Is there any difference comparing to your observations during STOR24. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date** 02 Nov 2010 till 02 Nov 2010


**Training Audience:** none

**Observers:** Andy Brown, BIROL GUVENC, Clive Wood, Jose Ruiz, Max Karlstrom

**Observer Teams:** none

**Response Cell** EXPCELL-FRA, EXPCELL-ACT, EXPCELL-SWE

**Observers:**

 **03.04 Assault Campaign 2 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.04.103 Air Refuel** (Injection)

Planned Date:	02NOV2010 1332Z	State	Injected
Actual Date	02NOV2010 1329Z	Means	PLEXComm Radio
Injector	EXPGEN	Coordinating Cell	EXPGEN
Location		Receiver	

**Description**

Air refuel

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start air refuel.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 34

It took too much time for JTLS to join due to high number of update requests. Resigned and tried again. Whoever kept asking for updates is not doing it anymore.

**Date:**

02 Nov 2010  
13:39:00

**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL  
OBSERVATION  
AND ANALYSIS

 Observation 35

Orque entities are received by but not reflected in JTLS due to JHIP issue

**Date:** 02 Nov 2010  
13:45:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST  
AND OBSERVER

 Observation 38

JTLS failed to reflect the tanker in the model, although it was reflected in HIP. The cause may be related to previous observation when JTLS had to resign and rejoin the federation.

**Date:** 02 Nov 2010  
13:54:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL  
OBSERVATION  
AND ANALYSIS

 Observation 37

VBS2-NLD participated and received aircraft entity from JTLS, marking 212.F352-02 DIS 1,2,225,1,12,0,0. Outside the terrain of VBS2-NLD.

**Date:** 02 Nov 2010  
13:55:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION  
AND AALYSIS  
CHIEF FOR TECH  
ISSUES

 Observation 44

FLAMES could not reflect the ORQUE and JTLS entities because it was not set up to subscribe. The effect of this was that the air tracks were not propogated to the Recognised Air Picture. NLVC Stealth and Plan View Display couldreflect the ORQUE , JTLS and TYR entities

**Date:** 02 Nov 2010  
14:11:00  
**Observer:** SCENARIONLVC  
**Observer Role:** SCENARIO

 Observation 84

JTLS sent the fuel request, Alligator responded, JTLS accepted the response and vectored the aircraft toward the refueler aircraft. The refuel aircraft moved away from the JTLS aircraft forcing the latter to speed up to overtake the refueler; this is a poor (overall) representation of how the process works in the real world. A refueler a/c might continue its orbit, but would either slow to

allow the other a/c to catch up or it would temporarily decrease the size of the orbit so that it could intercept the a/c needing fuel before it ran out.

**Date:** 03 Nov 2010  
13:41:00  
**Observer:** OBSERVERUSA  
**Observer Role:** OT

 Observation 99

There is no identifying attribute for an airmission to indicate its intent as a refueler. Although a receiving mission is aware of another mission carrying extra fuel, there is no method to determine whether the fuel on that mission is for a mid-air refuel or simply for forward resupply.

**Date:** 03 Nov 2010  
15:36:00  
**Observer:** JTLSOP1  
**Observer Role:** JTLS OP

 Observation 100

When the aircraft requested air-refuel from the tanker, the "Offer service" interaction was not sent timely. What we hope for is a quick offer from each refueler that we requested from. In this way, we can apply proper logic for choosing the appropriate tanker for refueling.

**Date:** 03 Nov 2010  
15:45:00  
**Observer:** JTLSOP1  
**Observer Role:** JTLS OP

 Observation 101

During the interactions for refueling, after the requesting aircraft sent "Ready to Receive Service" interaction, the tanker did not send "Service Started" interaction but instead it only sent "Service Completed" interaction. What we hoped for was to receive "Service Started" interaction in order to facilitate our refuel logic.

**Date:** 03 Nov 2010  
15:50:00  
**Observer:** JTLSOP1  
**Observer Role:** JTLS OP

 Observation 102

It is possible for the HIP Federate to discover the Site\_Id and Application\_Id Values. And from this, the publishing federate is discovered. However, there is currently no method for the name of the publishing federate to be reflected on the object in the WHIP.

**Date:** 04 Nov 2010  
07:50:00  
**Observer:** JTLSOP1  
**Observer Role:** JTLS OP

 Observation 113

CANCELLED. Some problem for JTLS to play the incident

**Date:** 04 Nov 2010

10:47:00

**Observer:**

OBSERVERFRA

**Observer Role:**

OBSERVER AND  
ANALYST IN  
EXPCCELL-FRA

 **STOR23** (Storyline Observation Task)

Observe the following:

- WAGRAM reflects TYR NETN\_aggregate objects
- TYR reflects WAGRAM NETN-aggregate objects
- JCATS reflects WAGRAM NETN-aggregate objects
- JCATS reflects TYR NETN-aggregate objects
- JCATS reflects WAGRAM munition-detonation interactions

**Date** 03 Nov 2010 till 03 Nov 2010

**Training Audience:** none

**Observers:** Andy Brown, Clive Wood, Jose Ruiz, Max Karlstrom

**Observer Teams:** none

**Response Cell Observers:** EXPCCELL-FRA, EXPCCELL-ACT, EXPCCELL-NLD

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.02.104 Ground strike 2 (Aggregated)** (Injection)

Planned Date:	03NOV2010 1329Z	State	Injected
Actual Date	03NOV2010 1356Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Indirect fire (platform-level)

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start indirect fire

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 88

TYR reflected terror aggregate entities south of Linköping.

None of the terror entities in Kvarn had aggregate entities published, so TYR did not see entities in Kvarn.

**Date:** 03 Nov 2010 14:12:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND ANALYSIS CHIEF FOR TECH ISSUES

 Observation 93

JCATS reflects WAGRAM NETN-aggregate objects  
JCATS reflects TYR NETN-aggregate objects  
JCATS reflects WAGRAM munition-detonation interactions

**Date:** 03 Nov 2010 14:41:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 121

Remark 1 : Aggregate units from TYR were reflected in WAGRAM.

Remark 2 : Munition use for WAGRAM fire is : 2.9.205.2.11.0.0


**Date:** 04 Nov 2010 10:54:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR25** (*Storyline Observation Task*)

Observe the following:

- WAGRAM reflects TYR NETN\_aggregate objects
- TYR reflects WAGRAM NETN-aggregate objects
- JCATS reflects WAGRAM NETN-aggregate objects
- JCATS reflects TYR NETN-aggregate objects
- JCATS reflects WAGRAM munition-detonation interactions
- JTLS reflects TYR NETN\_aggregate objects
- JTLS reflects WAGRAM NETN-aggregate objects
- JTLS reflects JCATS NETN-aggregate objects
- WAGRAM reflects JTLS NETN\_aggregate objects
- TYR reflects JTLS NETN-aggregate objects
- JCATS reflects JTLS NETN-aggregate objects

**Date** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Clive Wood, Jose Ruiz, Max Karlstrom, Amy Grom, Andy Bowers, Ellen Roland  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-FRA, EXPCELL-ACT, EXPCELL-SWE

 **03.04 Assault Campaign 2 (Internet with booster)** (*Storyline*)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.



**EO05 Technical standards** (*Primary Training Objective*)

To validate the MSG-68 recommendations for technical standards

 **03.04.104 Ground strike 2 (Aggregate)** (*Injection*)

Planned Date:	02NOV2010 1344Z	State	Injected
Actual Date	02NOV2010 1349Z	Means	E-MAIL
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Ground strike (aggregate)

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start ground strike

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 39

TYR did not participate, problems with, amongst other things, JTLS entities.

**Date:** 02 Nov 2010 13:56:00

**Observer:** ANALYSTTECH

**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 40

during terrorist camp attack, position correlation failure occurred between WAGRAM and JCATS

**Date:** 02 Nov 2010 13:59:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 41

TYR joined well after the start of the injection and federation

**Date:** 02 Nov 2010 14:05:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 57

JCATS didn't observe detonations due to data mapping issues

**Date:** 02 Nov 2010 14:06:00

**Observer:** CHIEFANALYST

**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 49

JCATS reflects WAGRAM, TYR and JTLS objects

JCATS does not reflect WAGRAM Munition Detonation interactions

**Date:** 02 Nov 2010 14:50:00

**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 112

Remark 1 : Aggregate units from TYR were reflected in WAGRAM.

Remark 2 : Munition use for WAGRAM fire is : 2.9.205.2.11.0.0


**Date:** 04 Nov 2010 10:46:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR26** (Storyline Observation Task)

Observe the following:

- VBS2-NLD platform and lifeforms are reflected in JCATS
- JCATS platforms and munition detonations are reflected in VBS2-NLD
- VBS2-NLD damage states are reflected in JCATS

**Date** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Clive Wood, Roger Jansen  
**Observer Teams:** none  
**Response Cell** EXPCELL-ACT, EXPCELL-NLD  
**Observers:**

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.02.105 Marine Blocking** (Injection)

Planned Date:	03NOV2010 1411Z	State	Injected
Actual Date	03NOV2010 1412Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Marine blocking

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Implement marine blocking.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 89

VBS2-NLD saw only one other vehicle/lifeform in the injection.

**Date:** 03 Nov 2010 14:31:00

**Observer:** ANALYSTTECH

**Observer Role:** OBSERVATION AND ANALYSIS CHIEF FOR TECH ISSUES

 Observation 96

VBS2-UK platform and lifeforms are reflected in JCATS

VBS2-UK damage states are not reflected in JCATS

JCATS does not react to shootings by VBS2-UK

**Date:** 03 Nov 2010 14:45:00

**Observer:** ANALYSTTECH2

**Observer Role:** TECHNICAL ANALYSIS

 **STOR27** (Storyline Observation Task)

Observe the following:

- VBS2-NLD platform and lifeforms are reflected in JCATS
- JCATS platforms and munition detonations are reflected in VBS2-NLD
- VBS2-NLD damage states are reflected in JCATS

**Date** 02 Nov 2010 till 02 Nov 2010


**Training Audience:** none

**Observers:** Andy Brown, Clive Wood, Roger Jansen

**Observer Teams:** none

**Response Cell** EXPCELL-ACT, EXPCELL-NLD

**Observers:**

 **03.04 Assault Campaign 2 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

**E005 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.04.105 Marine Blocking** (Injection)

Planned Date:	02NOV2010 1404Z	State	Injected
Actual Date	02NOV2010 1410Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Marine blocking

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Implement marine blocking.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 45

Due to the rescheduling of this STOR, VBS2-NLD is not connected.

**Date:** 02 Nov 2010 14:24:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 46

VBS2 UK didn't observe detonations of JCATS objects due to VBS2 ammunition effects mapping

**Date:** 02 Nov 2010 14:25:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 50

JCATS reflects VBS2-UK (not VBS2-NLD) entities.  
VBS2-UK damage states are reflected in JCATS. However VBS2-UK did not observe detonations of JCATS objects (probably because of problem with VBS2 ammunition effects mapping)

**Date:** 02 Nov 2010 14:52:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 **STOR28** (*Storyline Observation Task*)

Observe the following:

- KORA can provide and TYR consume convoy pattern
- TYR entities are reflected in KORA
- KORA entities are reflected in TYR

**Date:** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Max Karlstrom, ObserverDEU  
**Observer Teams:** none  
**Response Cell:** EXPCELL-DEU, EXPCELL-SWE  
**Observers:**

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (*Storyline*)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (*Primary Training Objective*)

To validate the MSG-68 recommendations for technical standards

 **03.02.106** Hostage Situation (*Injection*)

Planned Date:	03NOV2010 1427Z	State	Injected
Actual Date	03NOV2010 1429Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Hostage taken and situation resolved

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start hostage situation

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 94

KORA did not participate, Pitch Actors acts as a stand-in.

Transportation pattern was a success according to plan.  
During the transport the TYR entities did not update their position.  
Update on position was done when the service was completed

**Date:** 03 Nov 2010 14:32:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 91

as KORA currently unable to run on CFBLNet, it will be replaced by PitchActors for Evacuation Transport, with TYR to model the objects.


**Date:** 03 Nov 2010 14:37:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 **STOR29** (*Storyline Observation Task*)

Observe the following:

- KORA can provide and TYR consume convoy pattern
- TYR entities are reflected in KORA
- KORA entities are reflected in TYR

**Date** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Max Karlstrom, ObserverDEU  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-DEU, EXPCELL-SWE

 **03.04** Assault Campaign 2 (Internet with booster) (*Storyline*)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** *(Primary Training Objective)*

To validate the MSG-68 recommendations for technical standards

 **03.04.106 Hostage Situation** *(Injection)*

Planned Date:	02NOV2010 1425Z	State	Injected
Actual Date	02NOV2010 1457Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Hostage taken and situation resolved

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start hostage situation

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 51

TYR could not fully reflect KORA entities. TYR can only reflect entities in the orbat, that might be the problem.

So convoy pattern could not be consumed.

KORA seemed to be able to reflect TYR entities, judged from the voice communication.

**Date:** 02 Nov 2010 15:06:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND AALYSIS CHIEF FOR TECH ISSUES

 Observation 53

experiment delayed to tomorrow as KORA doesn't see TYR data

**Date:** 02 Nov 2010 15:09:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 **STOR30** *(Storyline Observation Task)*

Observe the following:

- WAGRAM can provide and JCATS consume repair pattern
- JCATS entities are reflected in WAGRAM
- WAGRAM entities are reflected in JCATS

**Date** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Jose Ruiz  
**Observer Teams:** none  
**Response Cell** EXPCELL-FRA, EXPCELL-ACT

**Observers:**

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.02.107 Repair** (Injection)

Planned Date:	03NOV2010 1444Z	State	Cancelled
Actual Date		Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Repair logistics pattern

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start repair

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 **STOR31** (Storyline Observation Task)

Observe the following:

- WAGRAM can provide and JCATS consume repair pattern
- JCATS entities are reflected in WAGRAM
- WAGRAM entities are reflected in JCATS

**Date** 02 Nov 2010 till 02 Nov 2010


**Training Audience:** none

**Observers:** Andy Brown, Jose Ruiz

**Observer Teams:** none

**Response Cell** EXPCELL-FRA, EXPCELL-ACT

**Observers:**

 **03.04 Assault Campaign 2 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
 Intel is that there is a terrorist camp, terrorist activity has happened.  
 The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.04.107 MEDEVAC** (Injection)

Planned Date:	02NOV2010 1512Z	State	Injected
---------------	-----------------	-------	----------

Actual Date	02NOV2010 1508Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

execute medevac injection

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start repair

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 **STOR32** (Storyline Observation Task)

Observe the following:

- WAGRAM can provide and JCATS can consume supply pattern
- JCATS entities are reflected in WAGRAM

**Date** 03 Nov 2010 till 03 Nov 2010

**Training Audience:** none

**Observers:** Andy Brown, Jose Ruiz

**Observer Teams:** none

**Response Cell Observers:** EXPCELL-FRA, EXPCELL-ACT

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists. Intel is that there is a terrorist camp, terrorist activity has happened. The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.02.108 Ammunition resupply** (Injection)

Planned Date:	03NOV2010 1444Z	State	Injected
Actual Date	03NOV2010 1443Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Ammunition resupply

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start ammunition resupply

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 97

WAGRAM having trouble to decode service request from JCATS as JCATS didn't set up time



stamp in a proper way

**Date:** 03 Nov 2010 14:57:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 98

JCATS entities are reflected in WAGRAM  
First request from JCATS had a small time window and is timed out. A second request with larger time window is sent and received by WAGRAM.  
The incident stopped earlier than planned

**Date:** 03 Nov 2010 15:08:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS

 Observation 117


Remark 1 : JCATS can only send the request with platform entities and wagram can only provides aggregates entities (units reflected in WAGRAM). Supply can't be offer!

**Date:** 04 Nov 2010 10:52:00  
**Observer:** OBSERVERFRA  
**Observer Role:** OBSERVER AND ANALYST IN EXPCELL-FRA

 **STOR33** (Storyline Observation Task)

Observe the following:  
- WAGRAM can provide and JCATS can consume supply pattern  
- JCATS entities are reflected in WAGRAM

**Date:** 02 Nov 2010 till 02 Nov 2010  
**Training Audience:** none  
**Observers:** Andy Brown, Jose Ruiz  
**Observer Teams:** none  
**Response Cell:** EXPCELL-FRA, EXPCELL-ACT  
**Observers:**

 **03.04 Assault Campaign 2 (Internet with booster)** (Storyline)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (Primary Training Objective)

To validate the MSG-68 recommendations for technical standards

 **03.04.108 Ammunition resupply** (Injection)

Planned Date:	04NOV2010 1000Z	State	Injected
Actual Date	04NOV2010 1004Z	Means	PLEXComm Radio
Injector	EXPCEN	Coordinating	EXPCEN

Location  
 Cell  
 Receiver

**Description**

Ammunition resupply

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start ammunition resupply

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 **STOR34** (Storyline Observation Task)

Prepare a questionnaire and collect the following data:

- Functionality of demonstrated Library Tool as a shared scenarios tool (i.e., does it satisfy the requirements, what are the weaknesses)
- Usability of the Scenario Data Submission form
- Reliability (crashes and reasons of crash if known)
- Speed local (Retrieve the scenario in EXPCCELL-ACT and measure the time it needs to load the scenario)
- Speed remote (Ask all the other experimentation cells to retrieve the scenario and time it)
- Stress test on the maximum number of users (both local and remote)
- Stress test on the query load (both local and remote)

**Date** 04 Nov 2010 till 04 Nov 2010

**Training Audience:** none

**Observers:** Andy Brown, Enrique Banales, Jose Ruiz, Max Karlstrom, ObserverDEU, ObserverGBR, Roger Jansen

**Observer Teams:** none

**Response Cell** EXPCCELL-ESP, EXPCCELL-FRA, EXPCCELL-ACT, EXPCCELL-DEU,

**Observers:** EXPCCELL-GBR, EXPCCELL-NLD, EXPCCELL-SWE

 **02.04 Shared Scenarios** (Storyline)

A prototype of the tool designed for the shared scenarios project and shared scenario procedures will be experimented. All the national experiment cells and ACT experiment cell will join to this experiment.

**E007 Shared scenarios** (Primary Training Objective)

To validate the MSG-68 recommendations for shared scenarios

**E006 Distributed training** (Secondary Training Objective)

To validate the MSG-68 recommendations for distributed training involving national and NATO C2 and simulation systems

**E001 Secure, persistent, on-demand training capability** (Secondary Training Objective)

To validate MSG-068 recommendations for a secure, persistent, on-demand training capability that integrates national centres and NATO

 **02.04.101 Send shared scenarios questionnaire to experiment cells** (Injection)

Planned Date:	27OCT2010 0000Z	State	Injected
Actual Date	05NOV2010 0730Z	Means	E-MAIL
Injector	EXPCEN	Coordinating Cell	EXPCEN
Location		Receiver	

**Description**

Shared Scenarios observer sends the questionnaire to all the experiment cells, which will have access to JEST to answer the questions in the questionnaire.

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start shared scenarios experiment. Use the questionnaire sent to you.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 129

The library allows submitting and sharing only scenarios. It had better to allow also the settings and scenario modules.

**Date:** 04 Nov 2010 15:32:00  
**Observer:** CAYIRCIE  
**Observer Role:** CHIEF EXPCEN

 **STOR35** (Storyline Observation Task)

Prepare a questionnaire for the overall NETN and NETN reference architecture.


**Date:** 02 Nov 2010 till 05 Nov 2010  
**Training Audience:** none  
**Observers:** Steven Blackstone, Vladimir Manda  
**Observer Teams:** none  
**Response Cell Observers:** EXPCELL-ACT

 **01.03** Manage and monitor CFBLNet infrastructure (Storyline)

NC3A manages and monitors the CFBLNet infrastructure.

**EO01** Secure, persistent, on-demand training capability (Primary Training Objective)

To validate MSG-068 recommendations for a secure, persistent, on-demand training capability that integrates national centres and NATO

 Observation 7

JTLS are missing perception information in the federation. Without it, JTLS can't show what external systems perceive and thus provide incomplete picture, although the system is on the same side.

**Date:** 02 Nov 2010 08:49:00  
**Observer:** ANALYSTTECH3  
**Observer Role:** TECHNICAL  
OBSERVATION AND  
ANALYSIS

 Observation 9

JTLS would appreciate if the FOM and FAFD package included C++/C#/Java classes for en-/decoding of all classes and interactions. This would allow everybody use the same code base and actually save a lot of time implementing their own en-/decoding technique.

**Date:** 02 Nov 2010 09:06:00

**Observer:**

**Observer Role:**

 **STOR36** (Storyline Observation Task)

Incident will be run from 1200-1245Z, 1300-1345Z, and 1400-1445Z.

Can you observe the entities and interactions (detonation and fire), respectively:

- FACSIM F16
- FLAMES F18 pair
- FACSIM stationary vehicles in the village
- FACSIM moving vehicles escaping the village
- GBR VBS2-VTK UAV
- TNO VBS2-VTK UAV
- JWC VBS2-VTK UAV

Has the NLVC capability proved interoperable with the MSG-068 recommendations?

**Date** 04 Nov 2010 till 04 Nov 2010

**Training Audience:** NLVC Audience

**Observers:** Andy Bowers, Andy Brown, Goos Cleveringa, ObserverGBR, Peter Langeslag, Roger Jansen, Ellen Roland, Enrique Banales

**Observer Teams:** none

**Response Cell** none

**Observers:** none

 **02.03 NLVC-1** (Storyline)

Forward observers located in JFTC (EXPCELL-ACT) and using FACSIM FAC station controls air mission (air to ground attack) that fly in FACSIM (F16). FLAMES (F18) in JFTC (EXPCELL-ACT controlled) fly combat air patrol. 3 VBS2-VTK UAVs observe villiage (1 X GBR @ DSTL, 1 X NLD @ TNO, 1 X JWC UAV but controlled from JFTC). Targets are armed vehicles in the villiage and any escaping vehicles. The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

**EO06 Distributed training** (Primary Training Objective)

To validate the MSG-68 recommendations for distributed training involving national and NATO C2 and simulation systems

**EO05 Technical standards** (Secondary Training Objective)

To validate the MSG-68 recommendations for technical standards

**EO04 Multi-granularity** (Secondary Training Objective)

To validate the MSG-68 recommendations for multi-granularity

 **02.03.001 NLVC concept and federation** (Intended Storyline Outcome)

The objective is to demonstrate that NLVC concept and federation work efficiently, make observations on the technical performance/procedures for NLVC, and determine utility for the NLVC capability to support Distributed Training and Exercises.

 **02.03.101 FACs are given tactical briefing** (Injection)

Planned Date:	04NOV2010 1000Z	State	Injected
Actual Date	04NOV2010 0943Z	Means	DELIVERED IN PERSON

Injector	EXPCELL-ACT	Coordinating Cell	EXPCELL-ACT
Location		Receiver	

**Description**

The forward air controllers (FACs) receive a tactical briefing to set the situation for the execution of the vignette. The briefing will direct them to destroy armed vehicles in and around the village.

**Functional Area Message**

\*\*\* EXERCISE EXERCISE EXERCISE\*\*\*

 Observation 123

In the first F16 run guided by SIMFAC, entities to be attacked were not reflected in VBS2

<b>Date:</b>	04 Nov 2010 12:22:00
<b>Observer:</b>	CHIEFANALYST CHIEF ANALYST AND OBSERVER
<b>Observer Role:</b>	

 Observation 132

NLVC Run #1, #2, AND #3 operational observations made by the FACs are uploaded to the documents section of JEMM. They are named NLVC run 1, NLVC run 2, NLVC run 3.

<b>Date:</b>	04 Nov 2010 15:05:00
<b>Observer:</b>	SCENARIO NLVC
<b>Observer Role:</b>	SCENARIO

 Observation 128

F-16 (FACSIM) aircraft seen in VBS2 UK. Appeared visually to have an incorrect altitude (aircraft were seen to fly below the UAV); but were showing correctly in local log.

F-18 (FLAMES) aircraft not visualized; showing in local log.

Static target vehicles (FACSIM) were visualized when VBS2 was running before entities were created in FACSIM. Entities timed-out and disappeared visually until change in entity state (i.e. K-KILL). We believe this was caused by FACSIM not providing regular updates to entities - but only updating when the state changed. This was fixed for VBS2 by changing a setting in VBS2 LVCGame configuration (changing to: hla1516e.deleteTimeout=0); and did not occur in the third vignette. Static vehicles displayed correctly in local log.

Moving vehicles displayed correctly both visually & in local log.

No munition detonations were observed from either system (FACSIM or FLAMES) – but entity state changes caused by both systems (K-KILL of target vehicles) was correctly visualized & shown in local log.

In the second vignette there was a delay of a second or two between PLEXcomm radio call of munition release / firing and the entity state change.

In the third vignette there was very poor PLEXcomm radio quality; and a poor frame-rate in VBS2. Frame-rate in other vignettes was good.

In order to operate VBS2 UAV at 8000 feet it was necessary to extend the terrain & object draw distances. This required us to reduce graphics quality (terrain detail, object detail, texture detail, shading detail, post-process effects, anisotropic filtering, shadow detail, anti-aliasing & bloom) all to "LOW". There was no noticeable degradation for UAV operations by this change; however a noticeable lag before texture was redrawn was observed when the UAV camera was slewed round to a new location.

A number of additional entity types had to be mapped in VBS2 to accommodate entities generated by FACSIM.

In the first vignette the UAV was directed to relocate to a new orbit 2NM west of the original location. Due to limitations in the display of distance measurements in VBS2 – this distance had to be estimated by the UAV operator.

AJP

**Date:** 04 Nov 2010  
15:16:00  
**Observer:** OBSERVERGBR  
OBSERVER  
AND ANALYST  
IN EXPCCELL-  
GBR  
**Observer Role:**

 Observation 131

The FACSIM vehicles and aircraft were visible in the FACSIM helmet mounted display (HMD) all through the vignette. During the larger part of this vignette the facsim vehicle entities were visible in the VBS2 UAV feed. Initially they were not due to setting problems.

**Date:** 04 Nov 2010  
16:19:00  
**Observer:** SCENARIOI NLVC  
**Observer Role:** SCENARIO

 Observation 133

Observation of Run 3 in JCATS-  
All ground and air entities were reflected in JCATS. Bombs were seen dropped by the F18A but no impact was observed. JCATS did reflect the damage state of terrorists in the model.


**Date:** 05 Nov 2010  
10:13:00  
**Observer:** USAEXPFLOW  
**Observer Role:** RC, OT

 **STOR37** (Storyline Observation Task)

Report the following about the network performance throughout the experiment:

- Utilization
- Round trip delay
- Throughput
- Jitter

**Date** 02 Nov 2010 till 05 Nov 2010  
**Training Audience:** none  
**Observers:** Steven Blackstone, Vladimir Manda  
**Observer Teams:** none  
**Response Cell**  
**Observers:** EXPCELL-ACT

 **01.02 Establish CFBLNet and the Internet connections** (*Storyline*)

All nations and NATO organizations connect to CFBLNet.

**EO01 Secure, persistent, on-demand training capability** (*Primary Training Objective*)

To validate MSG-068 recommendations for a secure, persistent, on-demand training capability that integrates national centres and NATO

**EO05 Technical standards** (*Secondary Training Objective*)

To validate the MSG-68 recommendations for technical standards

 Observation 14

Judging from Booster Manager screen the Internet connection to TNO has been lost.

Connection has been restored as of 09:52

**Date:** 02 Nov 2010 09:40:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL ANALYSIS AND OBSERVATION

 Observation 108

Observation of the current architecture/layout of the network indicates that the current layout is based on a hub-and-spoke topology. This topology may have an impact on scalability.

Location of the hub in this topology is crucial with respect to performance and planning.

**Date:** 04 Nov 2010 09:17:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL ANALYSIS AND OBSERVATION

 Observation 109

A network configuration using Internet only has been used.

Latency and bandwidth data have been recorded and need to be supplied and analyzed.

As an average:

Latency  
CHECK ms roundtrip time from JFTC to TNO  
CHECK ms roundtrip time from JFTC to DSTL  
CHECK ms roundtrip time from JFTC to Paris  
Numbers have been recorded using the pingplotter software.

Bandwidth  
CHECK between JFTC and DSTL  
CHECK between JFTC and TNO

unknown for Paris  
Numbers have been recorded using the iperf software.

**Date:** 04 Nov 2010 09:21:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL ANALYSIS AND OBSERVATION

 Observation 110

During the experiment it was observed that there has been a lack of appropriate tools allowing to perform specific simulation centric network measurements.

Tools for measuring network performance were available, but not deployed at all spoke sites.

**Date:** 04 Nov 2010 09:24:00  
**Observer:** ANALYSTTECH4  
**Observer Role:** TECHNICAL ANALYSIS AND OBSERVATION

 **STOR38** (*Storyline Observation Task*)

Observe the following:

- Orque can provide and JTLS can consume supply service
- Orque entities are reflected in JTLS
- JTLS entities are reflected in Orque
- JTLS aggregate units are reflected in TYR
- TYR aggregate units are reflected in JTLS

Is there any difference comparing to your observations during STOR22. Observe the differences also in performance (i.e., delay, and simulation speed that can be achieved).

**Date:** 03 Nov 2010 till 03 Nov 2010  
**Training Audience:** none  
**Observers:** ChiefAnalyst, Farshad Moradi  
**Observer Teams:** none  
**Response Cell:** EXPCELL-ACT, EXPCEN  
**Observers:**

 **03.02 Assault Campaign 2 (CFBLNet with booster)** (*Storyline*)

Terrorist Camp Assault built from vignettes - contains all vignettes

The campaign is to destroy the terrorist camp and capture the terrorists.  
Intel is that there is a terrorist camp, terrorist activity has happened.  
The decision to attack has been taken.

**EO05 Technical standards** (*Primary Training Objective*)

To validate the MSG-68 recommendations for technical standards

 **03.02.001 MSG-068 NETN Concept and Reference Federation** (*Intended Storyline Outcome*)

Prove that

- MSG-068 NETN concept is feasible
- MSG-068 NETN Reference Federation Architecture is practical

 **03.02.103 Air refuel** (*Injection*)



Planned Date: 03NOV2010 1329Z  
Actual Date 03NOV2010 1314Z  
Injector EXPCEN

State Injected  
Means PLEXComm Radio  
Coordinating Cell EXPCEN  
Receiver

Location

**Description**

Start air refuel incident

**Functional Area Message**

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

Start aggregate level ground strike.

\*\*\* EXERCISE \*\*\* EXERCISE \*\*\* EXERCISE \*\*\*

 Observation 86

TYR reflected some of the entities ok from JTLS, such as the aircraft to be refuelled, but many entities were not fully reflected. CallSign and EntityType seemed to be reflected, but other necessary attributes for TYR was not, like position, velocity etc. Though these entities were probably not relevant for the Air Refuel injection.

A400m the air-to-air refuel aircraft was not reflected to TYR. TYR team thinks A400m did not follow the orbit.

The refuelling procedure worked, service started as the crossed path, so the refuelling aircraft had to turn around and catch up before the service could be completed. Refuelling aircraft had to do an instant drop to the elevation of the air-to-air refuel aircraft.

**Date:** 03 Nov 2010 13:50:00  
**Observer:** ANALYSTTECH  
**Observer Role:** OBSERVATION AND ANALYSIS CHIEF FOR TECH ISSUES

 Observation 85

Orque provided and JTLS consumed supply service  
Entities are reflected in both JTLS and Orque. Vicinity of tracks was difficult due to difference in systems (High resolution/ Highly aggregated).

**Date:** 03 Nov 2010 13:50:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 95

Orque entities are reflected in JTLS  
TYR aggregate units are reflected in JTLS  
Interactions are reflected in JTLS as planned

**Date:** 03 Nov 2010 14:43:00  
**Observer:** ANALYSTTECH2  
**Observer Role:** TECHNICAL ANALYSIS


 Observation 122

Remark 1 : ORQUE received a supply request and acheive refueling with JTLS.  
 Provider is A400M and Consumer is 212.F351

Remark 2 : Aircraft of JTLS was reflected in ORQUE. Aircraft use for the supply was reflected.

Remark 3 : Unit from TYR was also reflected in ORQUE

**Date:** 04 Nov 2010 10:55:00  
**Observer:** OBSERVERFRA  
 OBSERVER AND  
 ANALYST IN EXPCELL-  
 FRA  
**Observer Role:**

 **STOR39** (Storyline Observation Task)


Ask the logistics audience:

- Is radio simulation a realistic and usefull tool for such training?
- Are simulation tools realistically simulating a MEDEVAC?
- Can this environment enhance the training?

Apart from that observe:

- VBS2 entities are reflected in VBS2-JWC and KORA
- KORA can pick up the casualties in VR-Forces

**Date** 04 Nov 2010 till 04 Nov 2010  
**Training Audience:** Logistics Audience  
**Observers:** Andy Brown  
**Observer Teams:** none  
**Response Cell**  
**Observers:** none

 **02.01 Logistics (MEDEVAC)** (Storyline)

Two troops modeled in VR-Forces by EXPCELL-ESP are wounded. A medical evacuation plan is developed by the operational people in EXPCELL-ACT send their plan to MEDEVAC responce cell in EXPCELL-DEU. Then EXPCELL-DEU mplements this plan in KORA to evacuate the wounded troops modelled in VR-Forces. All incident is also observed in the other models (i.e., JCATS, JTLS, TYR, VBS2).

**EO06 Distributed training** (Primary Training Objective)

To validate the MSG-68 recommendations for distributed training involving national and NATO C2 and simulation systems

**EO03 Distributed simulation integrating NATO and national M&S capabilities** (Secondary Training Objective)

To validate MSG-068 recommendations for distributed simulation integrating NATO and national M&S capabilities

 **02.01.105 Start the MEDEVAC** (Injection)

Planned Date:	04NOV2010 0900Z	State	Injected
Actual Date	04NOV2010 0852Z	Means	JEMM
Injector	UNKNOWN	Coordinating Cell	EXPCELL-DEU

Location

Receiver

**Description**

HICON deploys medical elements according to OPPLAN

**Functional Area Message**

none

 Observation 111

During the experiment, permanent radio contacts among participants were assured. Oral reports were broadcasted iaw the scenario and simulated situation. Radio simulation might add realism to such a training in case the background of the operators is on the same level. Radio should anyway be operated by operationally and/or technically experienced/ trained operators for the benefit of the activities

**Date:** 04 Nov 2010 09:32:00  
**Observer:** CHIEFANALYST  
**Observer Role:** CHIEF ANALYST AND OBSERVER

 Observation 127

VBS2 was crashing due to the hardware not able to handle a combination of:  
  
map size, joining the federation and VBS2 video options.

A laptop with more powerful graphics and up to date hardware running Windows 7 with stop most of the VBS2 crashes.


**Date:** 04 Nov 2010 15:03:00  
**Observer:** BROWNA  
**Observer Role:** JEMM ADMIN

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## Process Observation Tasks

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## Generic Observation Tasks

 **GEN40** (*Generic Observation Task*)

General observations that you couldn't put under specific observation tasks

**Date** 27 Oct 2010 till 05 Nov 2010

**Training Audience:** none

**Observers:** ACTOP, Amy Grom, ANALYSTOPR, Andy Bowers, Andy Brown, BIROL GUVENC, BROWNA, ChiefAnalyst, Chris Hall, CIEDOBSERVER, Clive Wood, David James, Edgar Harnsen, Ellen Roland, Enrique Banales, Farshad Moradi, Goos Cleveringa, Ivan Vianello, Jaap Middelburg, JCATSOP1, JCATSOP2, Jose Ruiz, Laszlo Csepely, Max Karlstrom, NLVCSPV1, NLVCSPV2, ObserverDEU, ObserverGBR, Olsson Lennart, Peter Langeslag, Robert Forsgen, Roger Jansen, SCENARIOBOGALAND, SCENARIOMEDEVAC, SCENARIONLVC, SHAREDSCEOB1, SHAREDSCEOB2, SHAREDSCEOB3, Steven Blackstone, Vilmos Kovacs, Vladimir Manda

**Observer Teams:** none

 Observation 130

The tempo/pace of the experiment, while beneficial in enabling comparison of the campaign execution over different network architectures, was too rapid to enable immediate analysis and resolution of problems during individual incidences. Over the course of the two technical experiment days, issues with most of the incidences were resolved; as a result the fourth execution of the campaign was much smoother than the first. This suggests that the network load of these different campaigns was less comparable than would have been possible if both campaigns had a full "dress rehearsal" prior to the first official day of execution.

<b>Date:</b>	04 Nov 2010 15:38:00
<b>Observer:</b>	OBSERVERUSA
<b>Observer Role:</b>	OT

<b>REPORT DOCUMENTATION PAGE</b>											
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<b>13. Keywords/Descriptors</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">CFBLNet</td> <td style="width: 50%;">Interoperability</td> </tr> <tr> <td>Distributed simulation</td> <td>Modular Federation Object Model (FOM)</td> </tr> <tr> <td>Distributed training and exercises</td> <td>NATO Education and Training Network</td> </tr> <tr> <td>High Level Architecture (HLA)</td> <td>Shared resources</td> </tr> </table>			CFBLNet	Interoperability	Distributed simulation	Modular Federation Object Model (FOM)	Distributed training and exercises	NATO Education and Training Network	High Level Architecture (HLA)	Shared resources
CFBLNet	Interoperability										
Distributed simulation	Modular Federation Object Model (FOM)										
Distributed training and exercises	NATO Education and Training Network										
High Level Architecture (HLA)	Shared resources										
<b>14. Abstract</b>	<p>NETN was originated to integrate and enhance existing national capabilities and focus on the education and training of NATO Headquarters' staffs and NATO forces. A NETN consisting of a persistent infrastructure, distributed training and education tools, and standard operating procedures not only supports the training of NATO headquarters but also enables the Nations to collaborate with each other. NETN promises a cost and time efficient capability, and broader and deeper interoperability. It also introduces an opportunity to integrate the training of NATO headquarters with the tactical forces when needed for short notice mobile mission rehearsal training. To meet this demand, Allied Command Transformation requested that NATO Modelling and Simulation Group start a technical activity in 2006. Modelling and Simulation Group 068 (MSG-068 NETN) was formed for this purpose in 2007. The MSG-068 NETN Task Group recommends and demonstrates a way forward for interoperability, technical standards and architectures to link the NATO and national training and education centres to provide a persistent capability, and also identifies and recommends roles and responsibilities within the scope of NETN. MSG-068 NETN Task Group conducted a distributed standalone experiment between October 25 and November 5, 2010 and a distributed demonstration during I/ITSEC 2010.</p>										





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