

# C2 - Simulation Integration

Bringing M&S to the battlefield



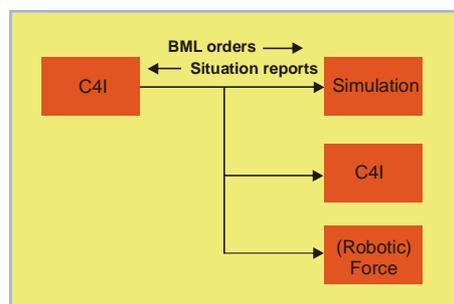
## Introduction

The success of modern military operations depends to a large extent on the commanders' speed, agility and quality of decision making. Consequently, armed forces are very interested in improved training systems for the Command and Control (C2) process and also in systems that may provide operational C2 support. Simulation is an important tool for C2 training purposes, but may also be used as a planning support tool in operational conditions (bring M&S to the battlefield). The Command & Control (C2) and Modeling & Simulation (M&S) domain have thus far independently aimed for interoperability with their peer systems. These two domains now need to be aligned more closely in order to provide automatic and rapid unambiguous initialization and control of one by the other. The C2-Simulation research projects conducted at

TNO explore this new field, which includes the emerging concept of **Battle Management Language (BML)**.

## Battle Management Language

BML is being developed by the Simulation Interoperability Standards Organization (SISO) as a standard representation of digitized C2 information, such as orders and plans, to be understandable for military personnel, for simulated forces, and for



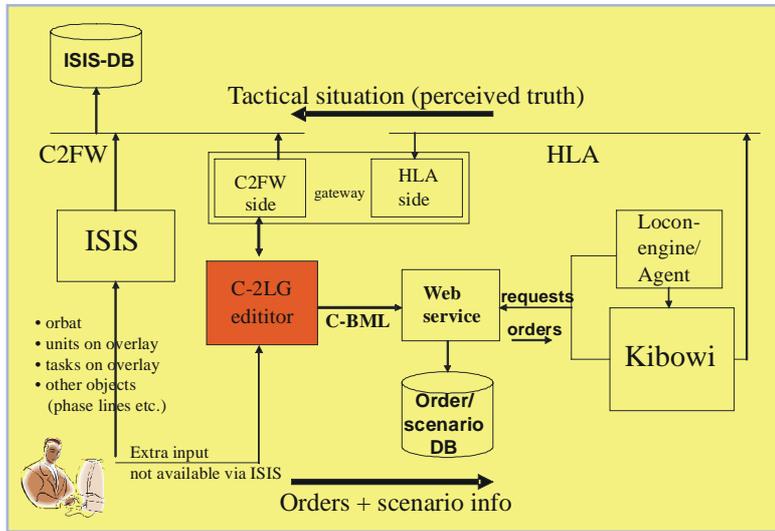
future robotic forces. In addition, BML must provide for situational awareness and a shared, common operational picture through digitized reports and returns. BML must also facilitate C2-Simulation interoperability in an environment where multinational distributed integrated capabilities are becoming more common and important. NATO is supporting the BML effort and refers to it as Coalition BML (C-BML). The C-BML work is carried out by NATO's MSG048 study group.

## Study Objective

The overall objective of our research is to perform a case study on C2-Simulator interoperability through BML in order to evaluate and contribute to the C-BML standard. The case study will be performed both nationally as well as internationally. The international work is done within the NATO-MSG048 group.

## Activities

The study is divided into three projects, which are part of the TNO research programmes "Multifunctional Simulation" (V517) and C4I (V507). The first of these three projects, "C2-Simulation Integration", concentrates on the C2 side. The other two projects focus on the simulator side and the use of intelligent agents, which support the lower commanders by transforming the higher level commands into low level commands for the simulator. The Royal Netherlands Army's (RNLA) ISIS C2 system is chosen as the C2 environment and TNO's Kibowi is used as the simulator. Kibowi is the research version of the RNLA's Command and Staff training system CaSToR.



University (US).

The diagram presents the foreseen architecture for the ISIS add-on. The TNO developed gateway feeds native ISIS data to the C2LG editor for further processing

TNO Defence, Security and Safety provides innovative contributions to the advance of comprehensive security and is a strategic partner of the Dutch Ministry of Defence to build up the defence knowledge-base. We employ our acquired knowledge for and together with contractors.

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### Adapting ISIS to C-BML

The "upgraded ISIS" must enable the ISIS user (the commander) to generate orders and plans in C-BML format.

However, the software of the ISIS system is at this time not accessible to TNO for modification work. The concept that we follow for our prototype is therefore based on an ISIS add-on and post processing of the ISIS data into C-BML and vice versa.

The add-on comes from one of our partners in the NATO-MSG048, the German Forschungs gesellschaft für Angewandte Naturwissenschaften (FGAN). FGAN developed a prototype C-BML editor which is called the C2LG editor (C2 Lexical Grammar editor).

ISIS will be used 'as is'. The operator inputs C2 information like tasks, initial positions of units, objects, phase lines etc. on graphical overlays on the map. This 'graphical' representation of tasks has no explicit information about who has to perform the task and under which conditions. The graphical plans can be easily read and understood by commanders, but are not machine-readable. This additional information must be added by the user with the add-on C2LG editor. The results are then available in C-BML format and are stored into a plan/order database via the Web services developed by MSG048 partner George Mason

and translation into C-BML. The diagram also shows how the Agent assisted Kibowi executes the C-BML instructions that are accessed through Web services.

In future experiments, the C2 systems and Simulation systems of our MSG048 partners will be linked with our national set up to test and evaluate exchange of C-BML orders and plans across coalition systems.

### Results

The results so far, consist of the architectural design of the C-BML adapted ISIS by using the C2LG editor and TNO Gateway, the scenarios for experimentation and a general set up of the coalition wide experiments that are foreseen for demonstration at the I/ITSEC tradeshow in November 2007 and during the course of 2008.

