SIMflash

KONGSBERG

Kongsberg Defence & Aerospace - Simulation & Training - ISSUE 1/2008

> **"KONGSBERG is a leading supplier of military simulator systems in the Nordic region"**

Ambitious, long-term focus

"Our vision is to strengthen this position through further growth. We intend to expand our product portfolio, enter into long-term and strategic partnerships with other important players, and take the lead with respect to technology," says Rune Johannessen, head of the Simulator & Training programme.

KONGSBERG's Simulation & Training business has experienced strong growth in the last couple of years. This has provided us with a solid financial platform and the freedom to upgrade the technology, and thus become a more attractive partner.

"One of our most important focus areas in the future will be systems integration. We want to deliver total systems that cover multiple training situations. Another important strategy is offering systems components to simulator suppliers in the international market," explains Johannessen.

The challenges associated with achieving interoperability between simulators.
Dag Gravningsbråten of KDA spoke at the ADL conference in Gol on 14-16 May this year. His talk garnered a lot of interest and a written version of it can be found on the next page.

The challenges
associated with achieving interoperability

Linking together simulators has been a subject of discussion in simulation environments for a long time. The idea is motivated by a wish to reuse systems in multiple contexts and thus save time and money.

Dag Gravningsbråten 25 August 2008

There are many examples of this being possible, but there are very few – if any – examples of simulator-based training systems in Norway in regular use that are based on linking together multiple simulators. This article sheds light on the challenges associated with establishing interoperability/communication between simulators from a linguistic angle. Linguistics is the study of language. Linguistics can also be used to shed light on what needs to be done in order to get simulator systems to talk to each other. The background material was obtained from articles by Marko Hofmann of the University of the German Federal Armed Forces in Munich.

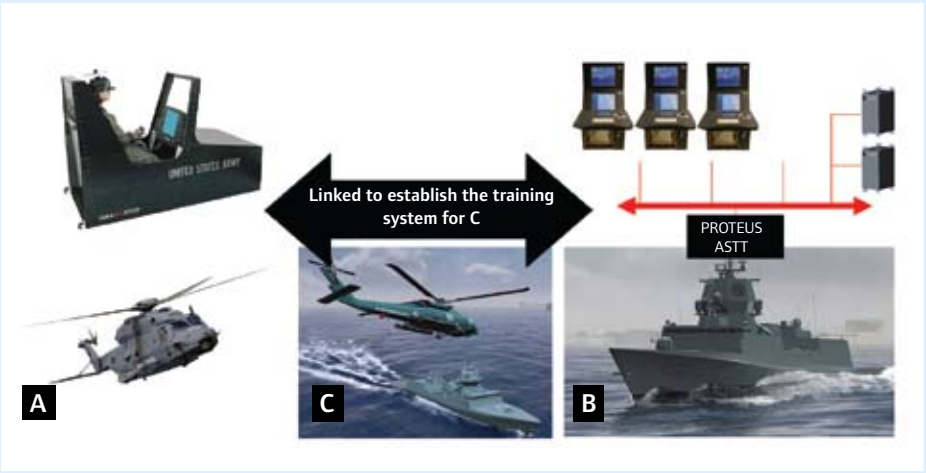
Simulation systems

Simulation systems are model based information systems. We create simulations/models of the real world, e.g. terrain, weather systems, vessels, vehicles, people, etc.

We say we are creating a conceptual model of what we are going to simulate. In short, a conceptual model (within the simulation domain) can be described as follows:

- An implementation-independent abstract description of the real world (a real system).
- A description of what a system does and how it works in a given context.
- A description of the properties of and interactions between all objects/models that have to be simulated and how accurate these must be.

Let's imagine we have two existing simulator systems for the real systems helicopter (A) and a frigate (B). We now want to create a training system for C in which both the helicopter and vessel are included by linking together the training systems for A and B.



The training systems for A and B were each created with their own conceptual model for the purposes they are intended to support.
The training system for C might have to contain elements that do not exist in either systems A or B, or which are implemented in different ways in A and B.

Examples:
- The helicopter landing on/taking off from the vessel
- The helicopter coordination officer on the vessel

Establishing a common conceptual model from existing models developed by different people for different purposes requires communication between the developers and experts involved in the real system C.

Linguistic communication

Linguistic communication can be categorised into different levels using some terms from linguistics:
- Technology
  The physical medium being used (air oscillations, telephone, letter)
- Syntax
  Rules stipulating how words can be combined into sentences and phrases
- Semantics
  The meaning of words and sentences
- Pragmatic
  What language users mean when they say/write something, or what the recipient comprehends the sender as meaning. Non-linguistic factors (context) contribute to determining how something is comprehended.

All of these levels must be present to enable people to communicate and understand each other. This is also true when it comes to establishing a common understanding of conceptual models, which is a condition for achieving successful interoperability between simulators.

There are languages for and ways of documenting conceptual models. But there is no standard that covers all communication levels. This is especially lacking at the pragmatic level, but is also lacking at the semantics level. This often results in the design being created containing hidden assumptions, and the consequences of these will probably first be discovered during the test phase with the consequences this has vis-à-vis possible redesign and increased costs.

The link

The linguistic levels we have looked at can also be applied when we look at the conditions for achieving successful interoperability between different simulator systems – or model based systems in general.

Technical aspects

Technical aspects – largely covered by the existing standards, such as LAN, Internet, the Norwegian Defence Forces Digital Network (FDN), Link XX, HLA RTIs, TCP/IP, UDP, CORBA, and DIS.

The challenges lie in:
- Choosing what offer the services one needs.
- Choosing the most uniform solution possible so one avoids having to create bridges between the different systems, though it is often better to create a bridge than create things anew.
- Choosing a standard that will be supported in the future

Syntax aspects

Syntax aspects – supported by standards like RPR FOM (HLA) and DIS protocols.
The challenges here lie in the fact that the standards do not cover absolutely everything one needs and nor can one express everything in natural language. Therefore expansions of legitimate syntax must often be agreed in each case.

The technology and syntax levels are the ones closest to what one can "easily" handle with computers. It becomes more challenging when we get to the semantics level.

Semantics aspects

Semantics aspects – supported by lexicons and dictionaries that explain the meaning of what is being communicated. The specifications for, for example, RPR FOM cover some of the needs we have for simulation, and HLA recommends that a dictionary called Object Model Data Dictionary (OMDD) to be used.

The challenges at this level lie in the fact that:
- There are no lexicons that cover all the possible meanings
- The lexicons largely do not cover dynamic/status changes for models
  E.g.: The algorithms for discovering targets are different for the two systems being linked together
  => Result in an "unfair fight"
  => Sometimes we need to use the same or compatible algorithms throughout the entire system

Pragmatic aspects

Pragmatic aspects – initiatives such as the semantic web and ontology exist that are intended to redress these deficiencies, but there is still some way to go in this area. Ontologies and AI technology also aim to support pragmatic aspects. However, there appears to be a good way to go before we will manage to automate this. We should be satisfied if we manage to uncover all of the areas we have to clarify and are able to create agreements for these in the design phase. An example of one issue that must be clarified is how the systems comprehend the order "Immediately attack target Z".

This could be understood as meaning:
- All entities drop all other tasks and move along the shortest route and with the highest speed to area Z, or
- All entities end current tasks and assemble in area A to coordinate optimum movement to Z in such a way that one's own cover/security is protected.

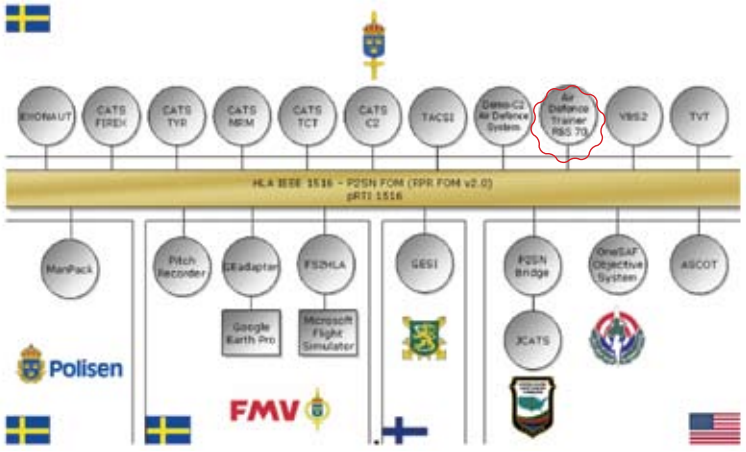
ITEC 2008

ITEC 2008 – Persistent Partnership Simulation Network

At ITEC 2008 in Stockholm, 18 different training systems from several countries and industry partners were to organise a common operation to combat terrorism in an African country in a fictitious scenario.

Simulator scenario
The federation (see picture) wanted to illustrate future methods for training and exercises in an effective way by forming persistent partnerships for training and simulation. The exercise was called the Persistent Partnership Simulation Network (P2SN). KONGSBERG has, through the Riktsim EldE70 project, delivered RBS70 training systems to two locations in Sweden. Through this project we were invited by the Swedish Defence Materiel Administration (FMV) to participate in the Persistent Partnership Simulation Network (P2SN). KONGSBERG has also participated in earlier integrations with other partners.

Implementation
The Swedish Defence Forces' headquarters developed and documented the objectives of the federation and requirements for the overall scenario and conceptual model. A federation agreement was formulated at a meeting of representatives of all the participating federates. This describes the interaction and responsibility of the participating systems. One of the most important sections of the agreement was the Federation Object Model (FOM), which specified the data that was going to be exchanged.



A plan for integration and testing was formulated. Among other things this plan entailed all of the federates being tested in a controlled environment before we tried to physically link them. This was done by each federate implementing and logging an exercise in which the objects they were responsible for were published. All of these logs were reviewed and checked. Once a log was approved it was added to a master log that collated them all. This master log was distributed so that every federate could test an exercise with objects from other federates.

During ITEC 2008 in Stockholm several demonstrations were executed every day, with great success. KONGSBERG is using this experience and is in the process of creating equivalent links between simulators with SAIC in the USA.

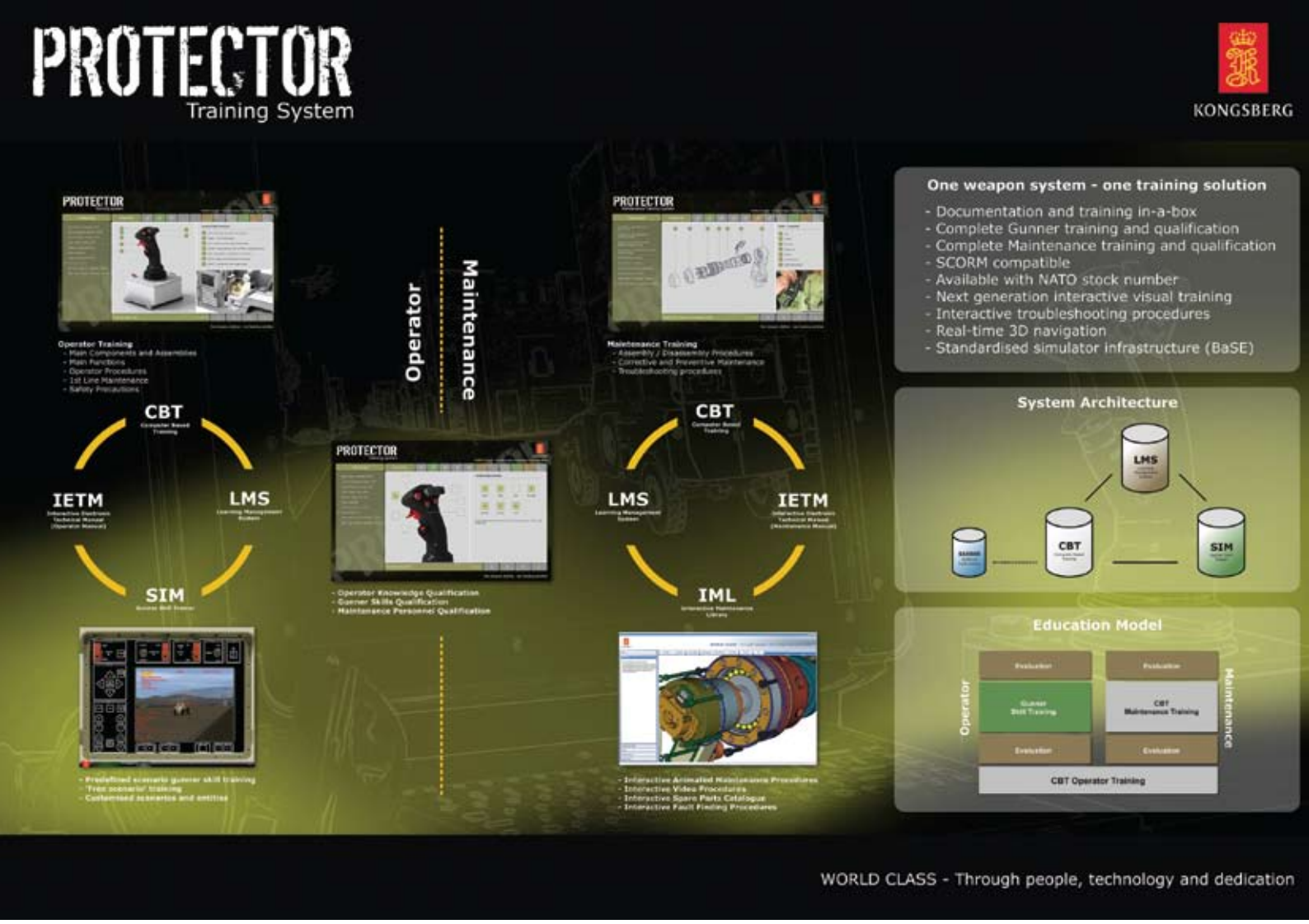
SUMMARY

The challenges associated with achieving interoperability between simulators

The challenges associated with achieving interoperability between simulator systems lie mainly in the communication between people and systems in areas for which there are no standards.

The standards are deficient, especially at the semantics and pragmatic levels.

It is neither realistic nor desirable to resolve everything using standards. The best conditions for achieving interoperability are if the people involved in implementing the links understand the vital properties (conceptual models, algorithms, etc) of the systems on both sides of the link.



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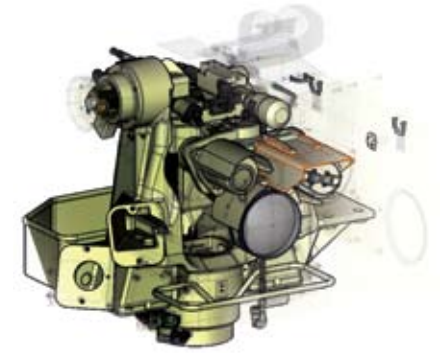

- Interactive exploded diagrams
- Video procedures of corrective maintenance
- Interactive troubleshooting procedures
- Real Time 3D parts catalogue
- Supports all PROTECTOR RWS configurations
- Touch screen ready

PROTECTOR Training System

KONGSBERG is currently enjoying great international success with our Gunner Skill Trainer for the PROTECTOR Remote Weapon Station.

We are currently supplementing the solution with Computer Based Training (CBT), Interactive Electronic Technical Manuals (IETM) and an Interactive Maintenance Library (IML).

CBT is being developed for operators and maintenance personal. The idea is to reduce the need for traditional classroom training. Given that everything is being integrated into a standard, rugged laptop PC, users will have everything they need with respect to training and documentation wherever they find themselves in the world.

IML is an application that combines video, interactive 3D drawings, troubleshooting procedures, and a parts catalogue in one and the same application.

IML is the true link between traditional documentation and E-learning. The user can disassemble and assemble the weapon station in 3D, watch video procedures carried out by an expert performing complicated maintenance procedures, search for special parts in an interactive parts catalogue, and much, much more.

IETM is the traditional documentation in electronic form. Including everything in the same physical package means maintenance personal do not have to carry extra folders and documentation with them.

You can find more info on:

www.kongsberg.com