Enhancing $C^2$ by use of simulation
- the Swedish view

Swen G Persson
Brigadier General
Commandant Swedish Defence Wargaming Center
107 85 Stockholm
Sweden

+46 – 8 788 8684
swen.persson@fksc.mil.se

Abstract

The Combined Joint Task Force-concept, created in NATO, is the concept to which all the other states within Partnership for Peace (PfP) have to adjust their staff procedures as well as their way of conducting operations. The key-word is “interoperability” which stands for not only changing information but also really operate in a multinational, multifunctional and multiethnical environment. They also have to work with procedures established in NATO using the english vocabulary including all NATO acronyms. In order to enhance the ability to conduct operations other than war Sweden and USA signed an MoU 1998 with the aim of developing, demonstrating and implementing a means for all who so want to participate in CAXs based on distributed simulation. The idea was presented at Washington Summit in April 1999 with a demonstration of the CJTF-concept. The first exercise was conducted by Sweden in November 1999 -VIKING 99 - and the second one is Peace Shield 2000 in Ukraine now in July. The concept of distributed simulations as means for enhancing command and control abilities has proven to be both a cost-efficient means and a provider of a realistic environment to the training audience. The main two challenges for the future are to further create connectivity between simulation-systems and that has to be done with HLA. The other is to make the simulation be an integrated part of the command and control information system, that is providing the staffs with information in the right way, at the right time and in the right format.
1. Why simulations?

The title of this presentation stems from the fact that we, in the military, are generally speaking, limited in economy when it comes to LIVEXs and at the same time not only dealing with war-fighting. At the same time the command-structure is being reorganized and the forces are down-sizing and redirected to meet a wider range of threats and risks. An other trend is the apparent focus on different types of operations other than war which increases the complexity both in the sense of multinationality but primarily in multifunctionality with military forces as well as police forces and civilian governmental and non-governmental agencies and resources working together but sometimes from different perspectives. To a great extent the military forces are supporting the civilians which for many people is something quite different from their traditional behavior as warriors in war.

Fundamental for all types of simulation is the fact that the training audience, independent of level, must be provided with an environment in which they experience the game as realistic. The best result will be achieved if the training audience can’t find any differences from what they experience in the game compared to their “normal” situation with live units in the field.

The interface between the participants both vertically and laterally must therefore as much as possible reflect the ”true situation”.

This includes both the adjudication, the information-flow as well as the technical means, such as C²- systems to be used.

An other essential objective is to achieve cost-effectiveness, which together with quality in the game, will found the base for superseding LIVEX with CAX.

It’s however important to bear in mind that a CAXs can never fully replace LIVEXs but very well serve as a complements thereto.

"Experience the Game as Reality"

and

"Many trained by a few"
2. *Swedish international commitments*

When it comes to international commitments the Swedish policy is based on the ambition to support the strengthening of the cooperative efforts together with other Partner- and NATO countries in order to achieve full interoperability for operations other than war.

The driving initiatives stated by US Secretary of Defence Cohen the summer of 98 are essential tools for achieving a higher rate of mutual understanding and interoperability in Command and Control. PSO gaming activities is an important part of this enhancement of PfP. The Consortium of Defence Academies, Exercise Simulation Network and Cooperative Network of PfP Training Centres provides the infrastructure for such activities.

The base for our work ahead is a five-year Memorandum of Understanding with the USA signed in November 1998 on designing, demonstration and implementation of a PfP Simulation Network based upon different available simulators and C²-systems.

The development of an ability to conduct exercises with distributed simulations aims at supporting the ultimate goal of increasing our ability to conduct PSO within the PfP framework.

3. *Simulations experiences*
In any exercise the training audience has various experience once starting. There must always be a gap between that level and the level of complexity and ambition in the exercise. The aim and objectives will set the frame for scenario, resources etc as well as for the required competence with the training audience.

In VIKING 99 the PTA was exposed to a very complex but realistic scenario, to new technic for many of the participants, to new (NATO) procedures, to a new and for many uncommon language and at the same time demands on filing reports, accomplish staff-work, make decisions and issue orders.

As was indicated in the beginning operations other than war have a complexity built-in because of the involvment of military as well as police and different civilian authorities.

The military is not always taking the lead but is always restricted in action in one way or another. The participating parties – military, police, GOs, NGOs and PVOs - will also have different objectives, sometimes contradictory.

For simulation of operations other than war the complexity of such an operation leads to a vast number of new rules of engagements and restrictions in action compared to warfighting.

Simulation of military units is well at hand. Almost everything can today be simulated. When it comes to simulation of non- military actions not very much has so far been developed, basically only simulation of movements.

4. Swedish simulations-system TYR

The training will in the future not only be on CJTF-level, so therefore the instruments (game-engines) must meet the needs for all levels concerned.

Our experience from "live" PSOs is also that it’s a much shorter way from top (polical level) to bottom (patrols etc) in that type of operation than in the case of war.

For C²-exercises Swedish Defence Wargaming Center (SDWC) base its capacity on one single system, called TYR after one of the old Viking-aesirs.

SDWC was established in 1994 and the first version of TYR was operational in 1995.
It is built on modules containing different elements such as orders for movement, detection, engagement and weapons-effect.

More information on SDWC and its philosophy, methods etc is to be found on [www.fksc.mil.se](http://www.fksc.mil.se)

TYR has been developed primarily for war-fighting on Joint Level for national purposes.

A version 1.9 has been developed during 1999 and was used for the first time for simulations during VIKING 99, the first "in the spirit of" PfP CAX executed in November-December last year.

TYR 1.9 uses what was common from 1.8, translated into English and with added rule-sets for PSO. The number of different orders has been more than doubled because of the complexity within a PSO compared to war-fighting.

In this game-engine single airplanes, ships and ground-patrols can be simulated and then aggregated up to joint level. Some non-military activities can also be simulated, primarily movements.

By only using ONE system (TYR) we have not yet met with the problem of communications between various instruments or simulation-systems even though the experiences from VIKING 99 clearly indicate the need for HLA-compliance for future use.

TYR is today not HLA-compliant but will be so from next year, especially in order to meet the special requirements from Swedish Armed Forces International Command, SWEDINT, for training on lower levels (brigade-battalion-company), where use of both constructive and virtual simulation is necessary for creating a "realistic" environment.

Virtual simulations can today be made with means from different developers in Sweden and abroad. Very few of them are HLA-compliant.
5. Major challenges

Our experiences lead us to believe that we now face eight main challenges as we focus on development of simulation for enhanced C²-capability and competence. This goes both for international cooperation in order to achieve interoperability and for national purposes.

Once again we have to go back to the basics, with reality and cost-effectiveness as the keywords.

5.1 Distributed simulation

Distributed simulation, in the sense of remote control of the game-engine, has already been demonstrated during both Washington Summit and VIKING 99. Distribution in the context of “cooperation” between more than one server/game-engine will be the next step enabling exercises with both constructive and virtual simulation at the same time. For doing so HLA-compliance is evident.
5.2 C²-systems

The second question is now whether and how to develop and implement a commonly accepted C² – system to be used in CAXs as well as in "real" operations. In order to achieve real interoperability with NATO it’s completely clear that C²-systems used by NATO, in for example Kosovo, must be made accesible for the whole coalition, at least as long it doesn’t inflict on national security. If not we will stand still with just radio and perhaps telephone and fax to use. Information superiority necessary for C² will then not be at hand and hamper the outcome of the operation.

For the exercise VIKING 99 we used the Swedish game engine TYR and the communications system HUGIN/DMS.

The training audience was then a Task force-staff on brigade level enforced by Air and Naval elements and the response cells represented by the battalion staffs and air and maritime components.

The response-cells communicated with TYR on ordinary telecom-lines.

Reports of different kinds were issued from the units (= TYR-operators) to the response-cells and further up to the training audience by use of HUGIN/DMS, e-mail-based systems,using ordinary telecom-lines. HUGIN is a ”push” system, while DMS operates as a client/server-system (“pull”).

Common Operational Pictures ( COP ) were created by shapshots from TYR for the Air and Maritime Components while the HUGIN was used for the Land Component. With the use of TYR it was possible to simulate for the training audience the picture produced by the sensors used by the Task force and its components.

Orders and directives were also issued through HUGIN/DMS or by phone and/or telefax.

The non-military activities were "simulated" by use of subject matter specialists ("role-players") and the experiences from this exercises have formed a plan for developing computer-assisted simulations of non-military activities.
5.3 Simulation of non-military activities

Perhaps the technically most difficult question is however, how to simulate all those non-military parties involved. There are no good answers now but VIKING 99 has given lots of ideas to work with. More information is expected to be shared at the next conference in Canberra later this year. The human behavior in different capacities must be defined and going from there we have to set the agenda for the development.

5.4 Multi-level training

Reality on lower levels means more of VR needed and especially 3D-sim in case you train on a level where units are expected to report based on their ”realistic” monitoring capacity. Today we focus on one, primary, level but it is possible to train at least two levels simultaneously.

This doesn’t mean that we anticipate training all levels simultaneously but, maybe two or three at most at the same time. The exercise Peace Shield 2000 in Ukraine next month will also provide us with inputs whether we should mix live units and simulated ones in the same exercise and if so under what preconditions. Parts of the scenario can then very well be detached for training on other, lower, levels. Maybe for validation of decisions taken higher up. Different types of simulators must also be involved which, at least in the short run, gives us restrictions on the number of levels simultaneously but also drives on towards HLA compliant, - compatible and interoperable simulation capacity.

5.5 Means for interoperability

As we now develop a system with distributed simulation for operations other than war in addition to what we´ve done previously for wargaming it will be possible for Swedish Defence Wargaming Centre to support, not only the Swedish Armed Forces with C2 simulations but also to support the defence academies - training centers and Partner states all over Europe, providing they
The first steps have been taken towards an instrument available for all for computer-assisted distributed C$^2$-training on all levels.

6. Conclusions

The main conclusion of what I´ve said here today is however that it will not be possible for most countries to meet all the challenges I´ve mentioned on an isolated national basis.

Symposiums and workshops are therefore important with sharing of experiences and knowledge pushing M&S forward, HLA is one part in this push. The ultimate aim must be to make the simulations a means for enhancing the competence in Command and Control of forces both for national reasons but also for operations other than war within a multifunctional and multinational framework.