



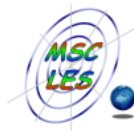
# ***SIMCJOH***

*Simulation of Multi Coalition Joint  
Operations involving Human Modeling*

## **EXECUTIVE SUMMARY**



DIME  
Università  
di Genova



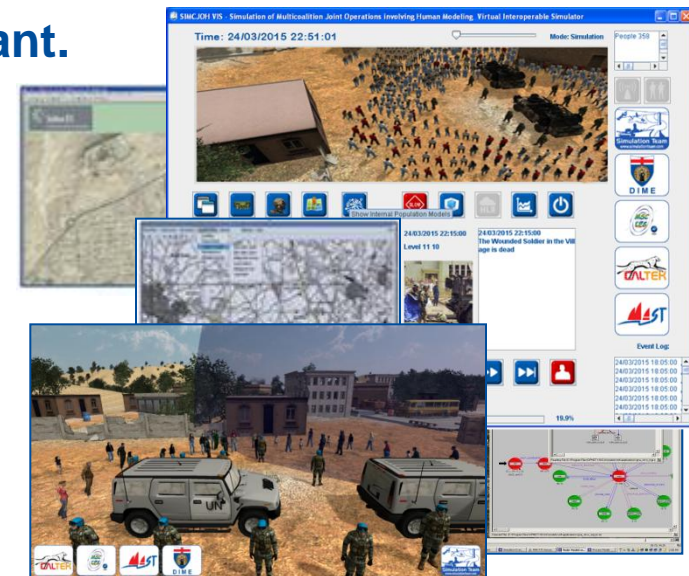


# Introduction to SIMCJOH

Simulation of Multi Coalition Joint Operations involving Human Modeling

The SIMCJOH project is devoted to carry out R&D activities with the aim of understanding at which extent interoperable simulators could be used (in a multi-coalition context) by the Commander and his Staff to address and solve specific problems where human factors are relevant.

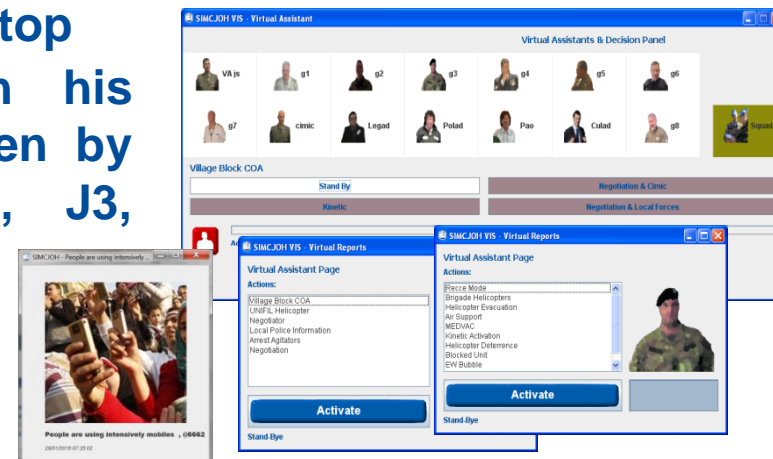
Modeling & Simulation makes possible recreating complex scenarios and carrying out what-if analyses with the aim of evaluating the effectiveness of several alternatives (Course of Actions, COAs) and therefore prepares the Commander and his Staff to face unusual situations





# The SIMCJOH Strongholds

- SIMCJOH combines Interoperable Simulation and Serious Game
- It results user friendly and intuitive moving from Desktop Stand Alone Simulator to HLA Federation available for CAX.
- SIMCJOH VIS includes Human Behavior and Intelligent Agents reproducing dynamic MEL/MIL in Complex Scenarios and the evolution respect possible COAs and contingency
- SIMCJOH VIC reproduce the Virtual Environment allowing to get an immersive representation of the situation.
- It could be easily used in SPIDER Interactive Virtual CAVE and/or Virtual Reality Helmet or from a laptop
- The Commander interacts with his virtual staff (several avatars driven by Intelligent Agents e.g. J1, J2, J3, POLAD, LEGAD, CULAD, etc.)





# Dynamic MEL/MIL and COAs in SIMCJOH



- SIMCJOH Intelligent agents control Multicoalition units, OPFOR, population and Virtual Assistants soliciting the Commander to address the crisis and proceed in a multiple steps decision making process that evolves dynamically as the situation.
- Based on the selected MEL/MIL, the SIMCJOH Federate generates events and proposes COAs to the Commander. He could adopt a specific COA or refine its planning. It is possible to request further actions, assessments to and shape the final decisions based on new events.
- the Commander is entitled to assign task to his virtual staff as in reality to check COA feasibility, collect additional data, evaluate legal consequences as well as secondary effects on population, etc.

## Situation Report

Village Block. The area around the village Chamaxa is Safe, but a squad has been seized off the village. Our squad is blocked by population and they require to surrender our weapons to get clearance to leave the village; the squad leader is in the negotiation, the reserve of the regiment is engaged in other military ops, and 2 Platoons and 1 helicopter(s) from the brigade reserve was to support the Squad evacuation operations. The village has not received object during the last 3 months. The last CIMIC was Partially Failed for the village inhabitants. The village is characterized by a No presence of Hostile Forces. In the past there were Several in the last 4 months. The village has 2 Good opportunity for snipers. The distance toward video-photographic the national radio network. Currently No Coverage by Media Yet. Local opinion Mostly Favorable Percentage

**COA0: Simply Stand By**

**COA1: Negotiation & CIMIC**

1) Negotiation & CIMIC

**CIMIC**

Introduction of a CIMIC specialist to assist in the negotiation process. CIMIC specialist will be available for the negotiation process. CIMIC specialist will be available for the negotiation process. CIMIC specialist will be available for the negotiation process.

**COA2: Kinetic**

3) Kinetic

COA	Military effect	Effects on population	Risks	Mitigations
Kinetic				

**COA3: Local Police Negotiation**

SIMCJOH VIS - Virtual Assistant

Virtual Assistants & Decision Panel

VA js

g1

g2

g3

g4

g5

g6

g7

cimic

Legad

Polad

Pao

Culad

g8

Squad

Village Block COA

Stand By

Negotiation & Cimic

Kinetic

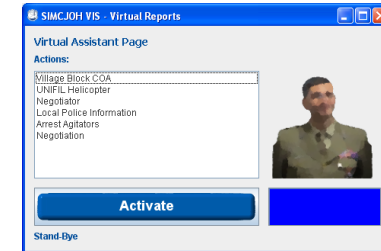
Negotiation & Local Forces

Activity

Stand-by



# The Commander and Intelligent Agents



The Commander interacts in SIMCJOH with his Virtual Staff driven by the IA-CGF Intelligent agents in different ways:

- **Synchronous Activities:** structured actions related to the COAs analysis that are affected by stochastic elements (etc. processing times, reliability, etc.)
- **Asynchronous Activities:** actions by the Commander (e.g. asking the staff for additional data, evaluations, information) or events generated by the Simulator (e.g. someone gets injured, shooting) that can take place at any moment of the game and is influenced by boundary conditions.

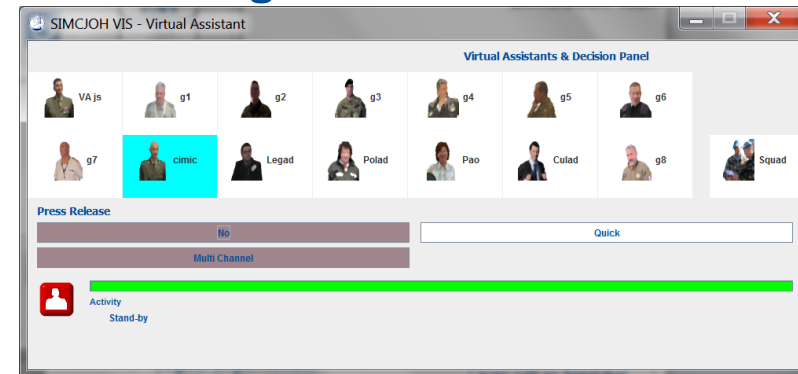
Based on COA selection, the SIMCJOH VIS discrete event simulation runs and make evolving the MEL/MIL stochastically. The SIMCJOH VIS is able to carry out multiple fast-time replications of the same simulation run and it is able to evaluate Military Effects, Secondary Effects on Population and Risks measuring Key Performance Indexes



# SIMCJOH Virtual Assistants

SIMCJOH includes Intelligent Agents controlling the Virtual Staff and Virtual Assistants including:

- JCoS: Joint Chiefs of Staff
- G1: Personnel and Manpower
- G2: Intelligence
- G3: Operations
- G4: Logistics
- G5: Strategic Plans and Policy
- G6: Command, Control, Communications and Computers/Cyber
- G7: Operational Plans and Joint Force Development
- G8: Force Structure, Resources, and Assessment
- G9: CIMIC (Civil Military Cooperation)
- Legad: Legal Advisor
- Polad: Political Advisor
- PAO: Public Affair Officer
- Culad: Cultural Advisor



*Commander interacts even with an Agent representing the people of the Blocked Squad in the village*



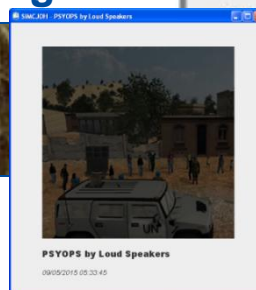
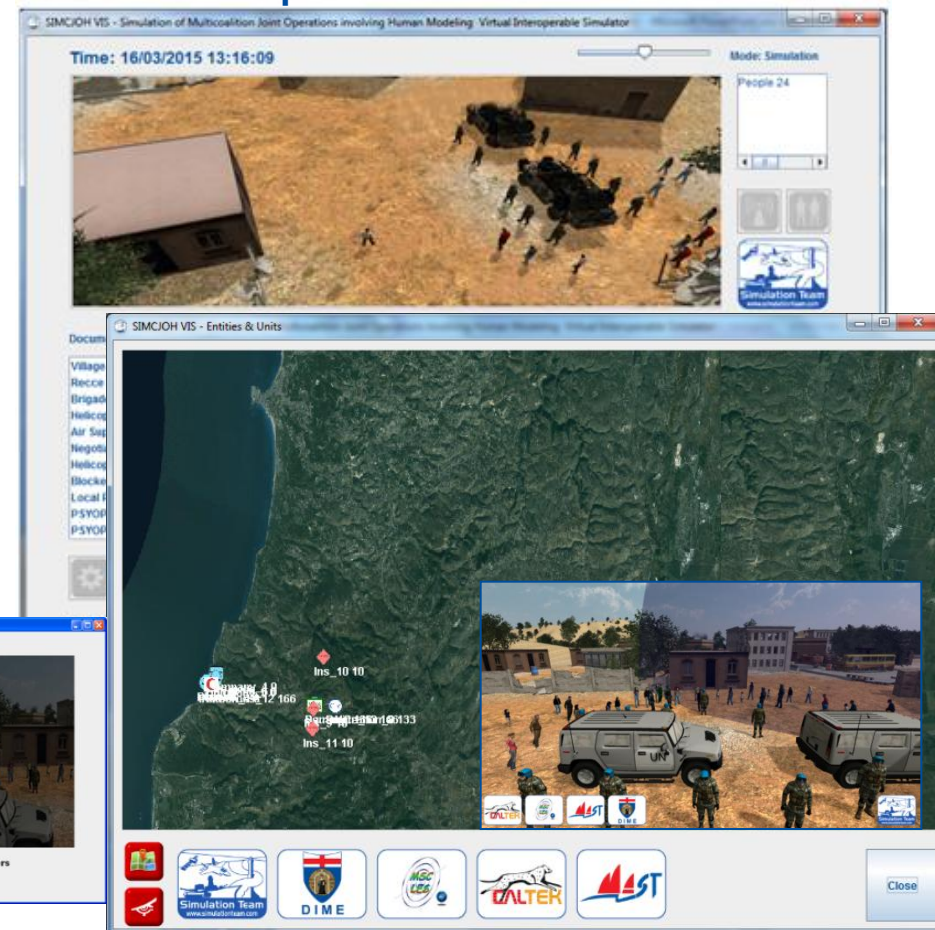
# SIMCJOH VIS & VIC

Simulation of Multi Coalition Joint Operations involving Human Modeling  
Virtual Interoperable Simulator & Virtual Interoperable Commander

**SIMCJOH VIS** includes stochastic Population Model, HBM as well as IA-CGF and Virtual Assistants.

**SIMCJOH VIS** generates dynamically the reports and analyzes the situation, suggesting decisions and assign high level tasks. The simulator includes multiple interface able to deal with complex scenarios.

**SIMCJOH VIC** provides a virtual framework able to evolve during the

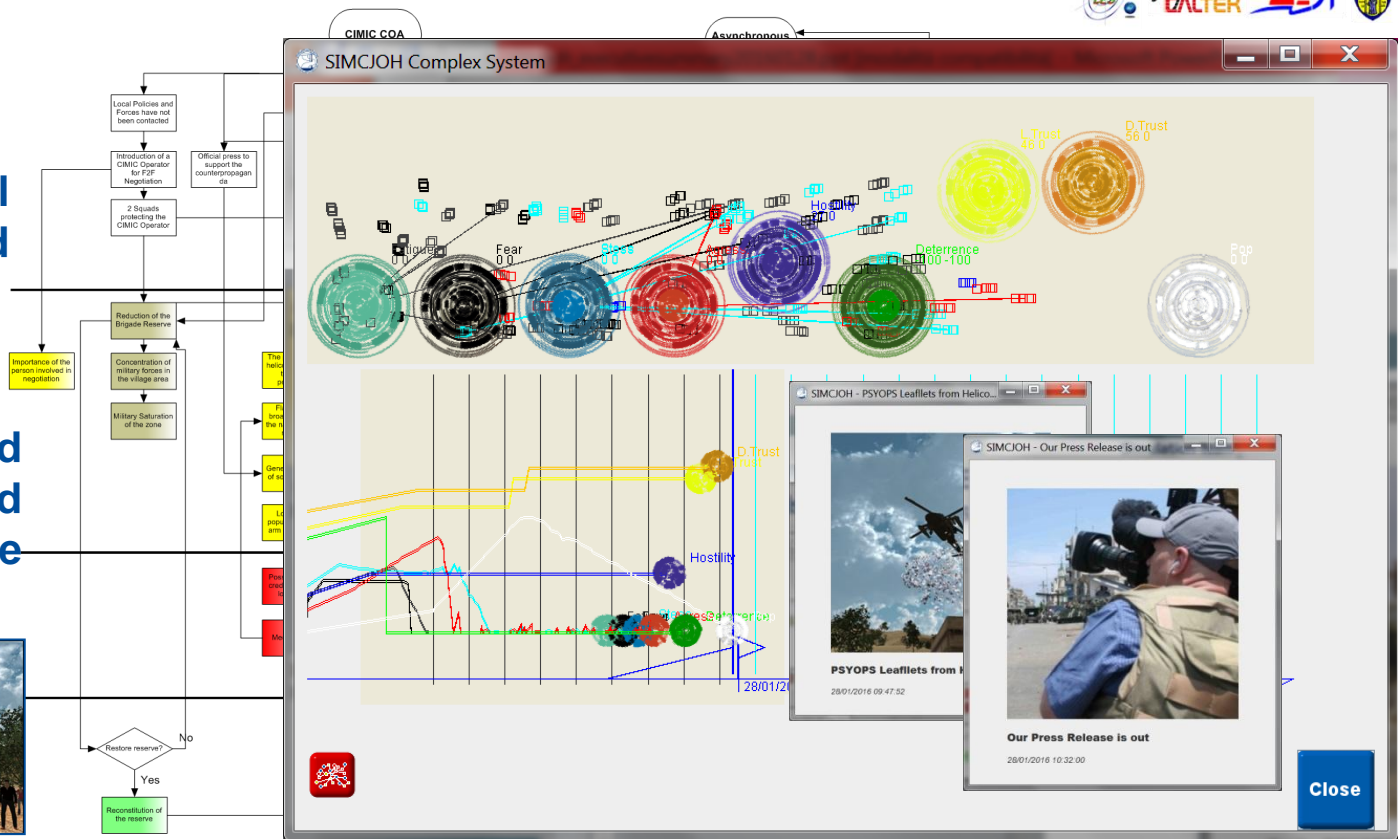
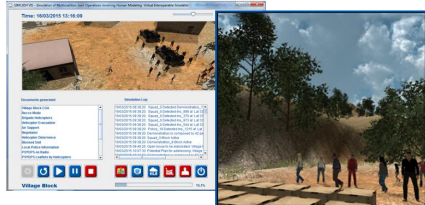




# The MEL/MIL and Human Behavior Models



The Conceptual Models and Human Behavior Models (HBM) are implemented in SIMCJOH VIS and SIMCJOH VIC and represent the core of the simulation



- SIMCJOH VIS** Simulation of Multi Coalition Joint Operations involving Human Modeling Virtual Interoperable Simulator
- SIMCJOH VIC** Simulation of Multi Coalition Joint Operations involving Human Modeling Virtual Interoperable Commander
- MEL/MIL** Master Event List, Master Incident List

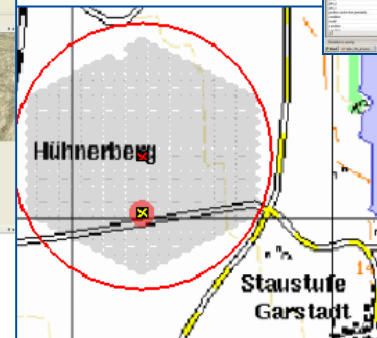
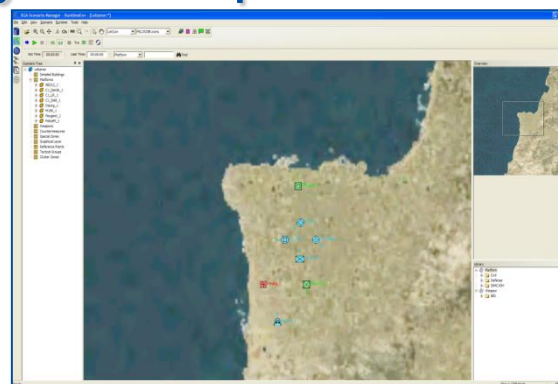
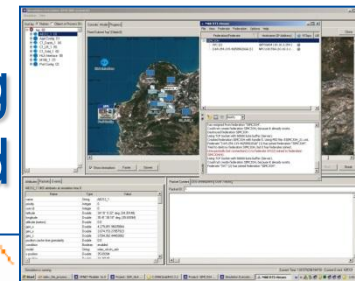
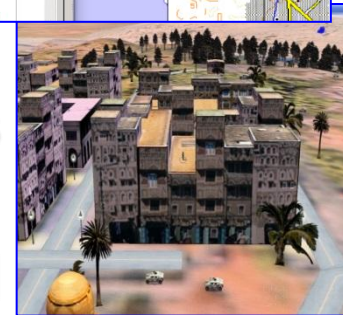
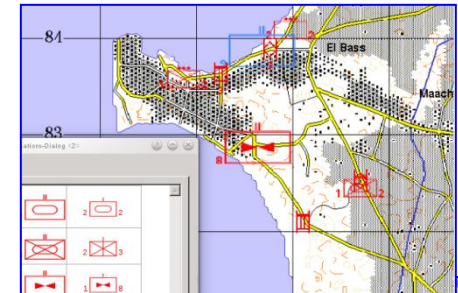




# SGA, NCS & GESI

SGA has been upgraded to be federated in SIMCJOH to reproduce platforms and units interacting with the other models

NCS is a detailed communication model available for reproducing specific aspects of ICT  
In addition, GESI has been integrated allowing to reproduce entity level operations and detailed tactical actions



- SGA Scenario Generator and Animator
- NCS Network Communication Simulator
- GESI GEfachts-Simulation System
- ICT Information & Communication Technology

 **FINMECCANICA**  
LAND & NAVAL DEFENCE ELECTRONICS DIVISION

 **CAE**



# Conceptual Models for MEL/MIL, COAs



- SIMCJOH includes Conceptual Dynamic Stochastic Models of MEL/MIL and COAs
- SIMCJOH allowed to investigate MEL/MIL with strategic impact on the Coalition such as the case of a Squad of soldiers under United Nation hat, that is blocked into a village by population.
- SIMCJOH simulate the demonstration in terms of attitude, composition and dynamics growing based on human factors, boundary conditions and decision taken by the Commander
- The squad Commander and forces are driven by IA-CGF based on decisions of the Commanders and affected by Human factors.
- The Virtual Staff analyze the situation and activates procedures to support the situation preparing proposals and COAs
- Three COAs, named CIMIC, KINETIC, LOCAL FORCES respectively, are generated dynamically based on the MEL/MIL specific status of the simulation
- The COA description are generated including Military Effects, Secondary Effects on Population, Risks deriving from COA, possible Mitigation Actions.

**MEL/MIL: Master Event List, Master Incident List**

**COA: Course of Action**

**UNIFLI United Nations Force for Large Improvement of Eblanon**

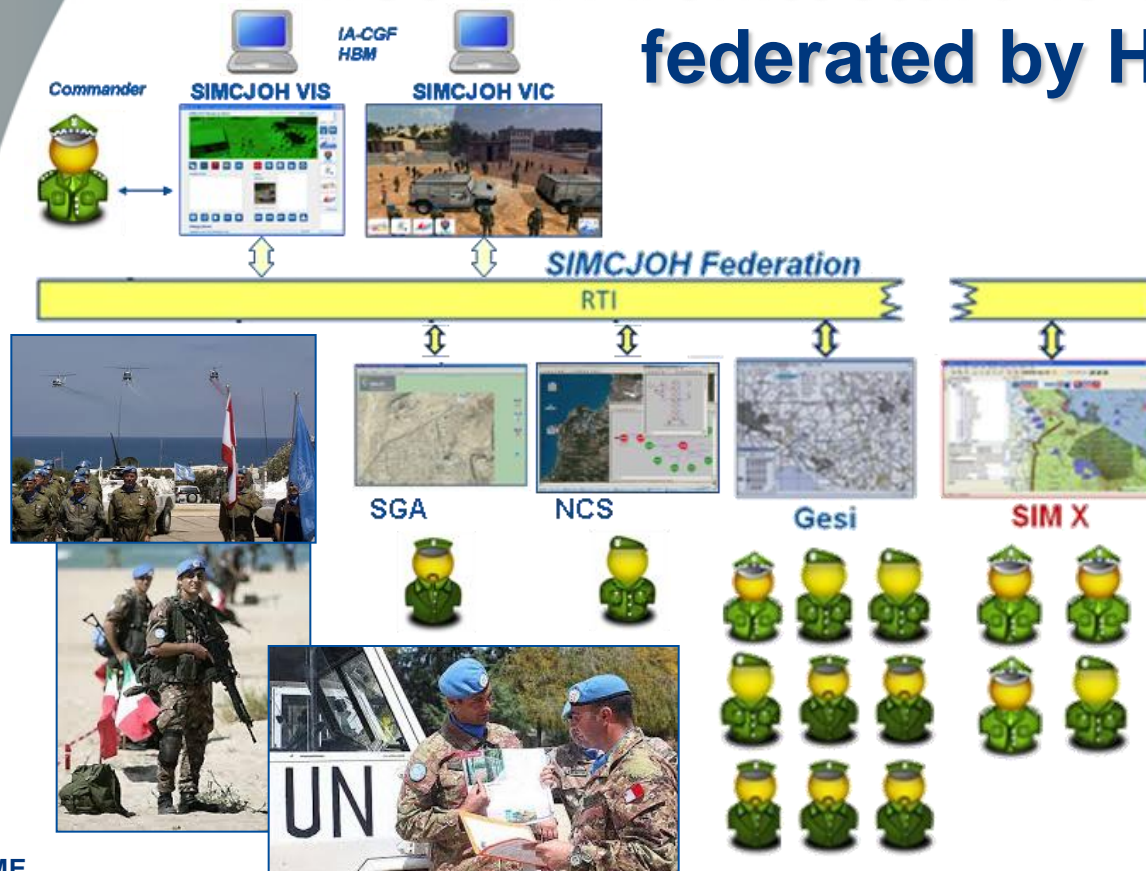
**CIMIC: Civil Military Cooperation**





# SIMCJOH as Open Framework

**SIMCJOH Architecture is open to be fully federated by HLA**



SIMCJOH adopts HLA standard for distributed simulation enabling the possibility to integrate as new federates other models and/or different kind of real systems.

SIMCJOH interoperability guarantees to be able to use it as element of a complex CAX for simulating critical issues and human behaviors



# SIMCJOH: Eblanon or Lebanon

The main scenario is defined as Eblanon inspired to the United Nation mission in Middle East. Indeed the Lebanon represents a good example to be used as SIMCJOH simulation scenario considering the complexity of the contents as well as the dynamic situation evolving in the region:

- Complex Composition of Population and Interest Groups
- Internal presence of threats related to political and religious (e.g. al-Nusra, ISIS, Hezbollah) interests and of external critical situations (e.g. Syria, Israel, Iraq, Iran, Yemen, Saudi Arabia, Turkey, Egypt, etc.)
- Economic connections with Italy and Europe
- Presence of the UNIFIL Multicoalition by United Nations
- Impact of actions in Lebanon on entire Middle East and interest of NATO

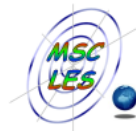




# ***SIMCJOH***

*Simulation of Multi Coalition Joint Operations involving Human Modeling*

## **Project Overview**

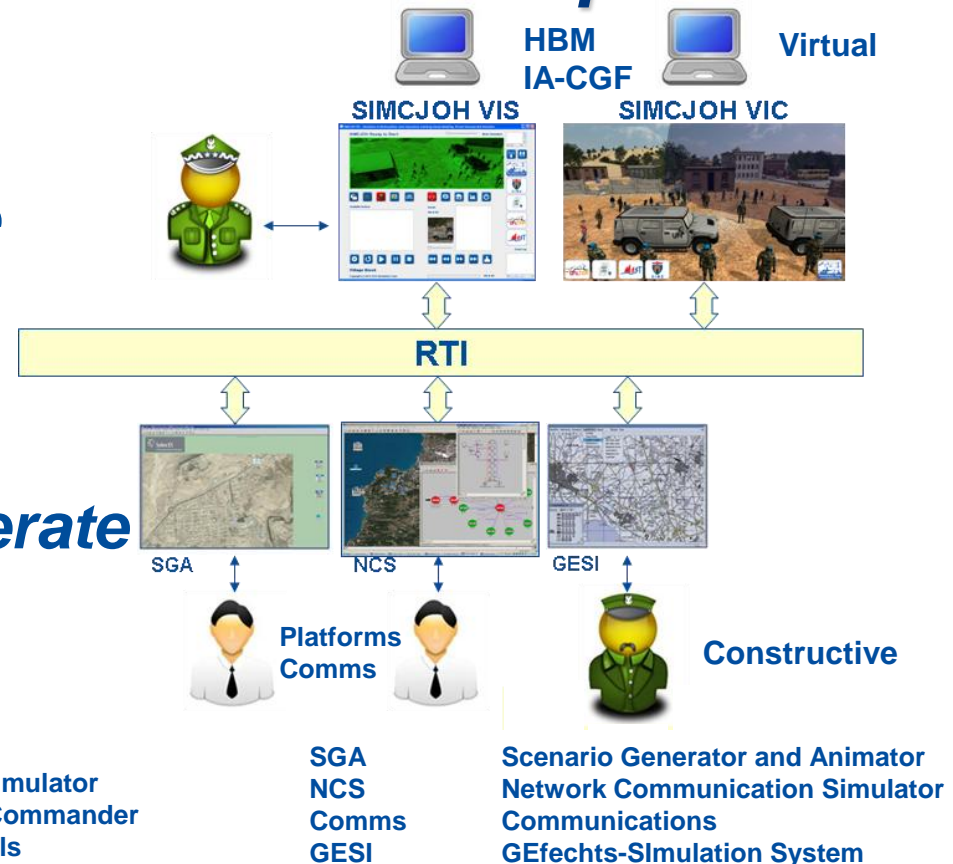




# SIMCJOH Overall Architecture

## SIMCJOH Architecture Main Components

- **SIMCJOH Federation**
  - **HBM & IA-CGF Federate**
    - **SIMCJOH VIS**
  - **Virtual Federate**
    - **SIMCJOH VIC**
  - **Platform & Comms Federate**
    - **NCS/SGA**
  - **Constructive Federate**
    - **GESI**



VIS Virtual Interoperable Simulator  
 VIC Virtual Interoperable Commander  
 HBM Human Behavior Models  
 IA-CGF Intelligent Agent Computer Generated Forces

SGA  
 NCS  
 Comms  
 GESI

Scenario Generator and Animator  
 Network Communication Simulator  
 Communications  
 Gefechts-Simulation System



# SIMCJOH Stand-Alone Mode using RTI



SIMCJOH could operate in Stand-Alone mode on a single PC (or a couple) by using RTI. In this case both Discrete Event and Virtual Simulation will operate managing Events, Actions, Virtual Assistants. COA as well as 3D Immersive Representation



Commander



SIMCJOH VIS



IA-CGF  
HBM



SIMCJOH VIC



RTI



# SIMCJOH Stand-Alone Mode even without Installing RTI



Stand alone mode be used even on a computer without installing RTI. SIMCJOH in this configuration provides full Discrete Event Simulation with Events, Actions, Virtual Assistants, COA of the MEL/MIL. The Commander is able to run the whole scenario, but obviously no virtual simulation or other entity level simulation could be federated



Commander



IA-CGF  
HBM

SIMCJOH VIS





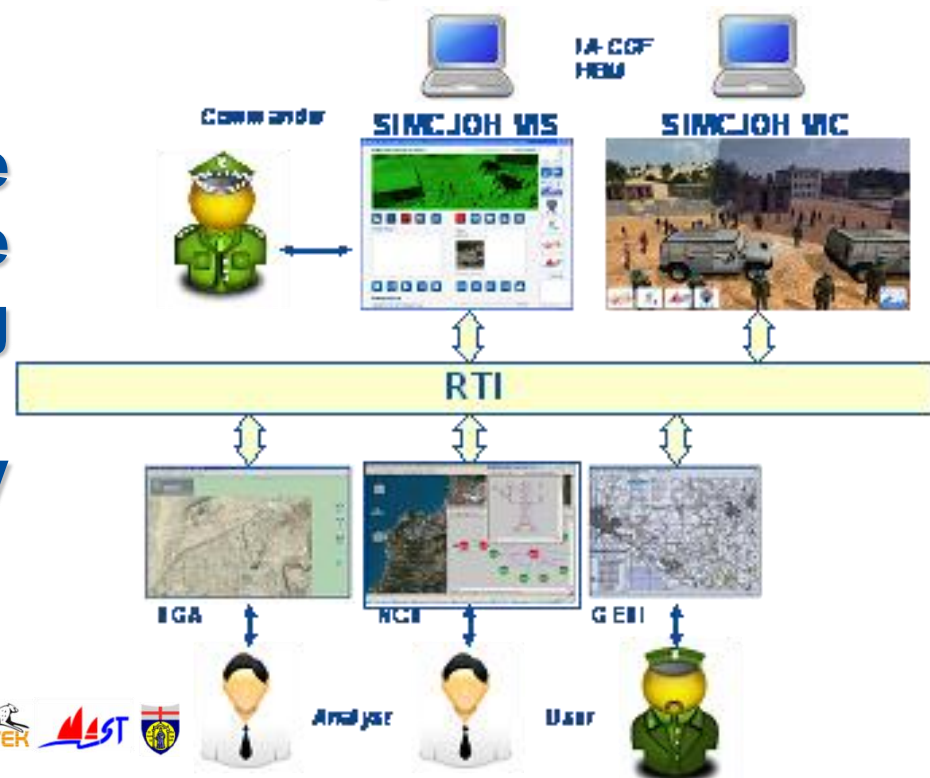


# SIMCJOH

## Fully Federated Mode

### *Example of SIMCJOH Architecture: Fully Federated Operational Mode*

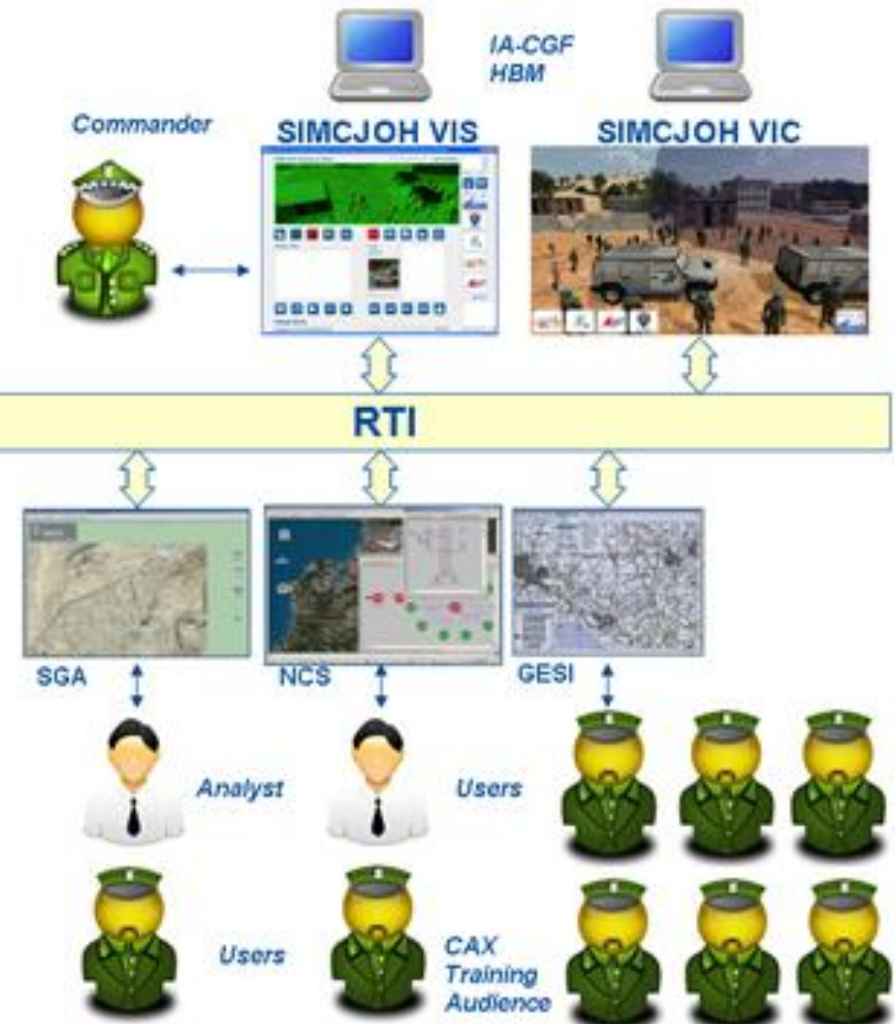
SIMCJOH could use the fully federated mode this provides the possibility to simulate the whole scenario by using both Discrete Event and Virtual Simulation, entity based simulators, platforms simulator





# SIMCJOH Architecture for CAX

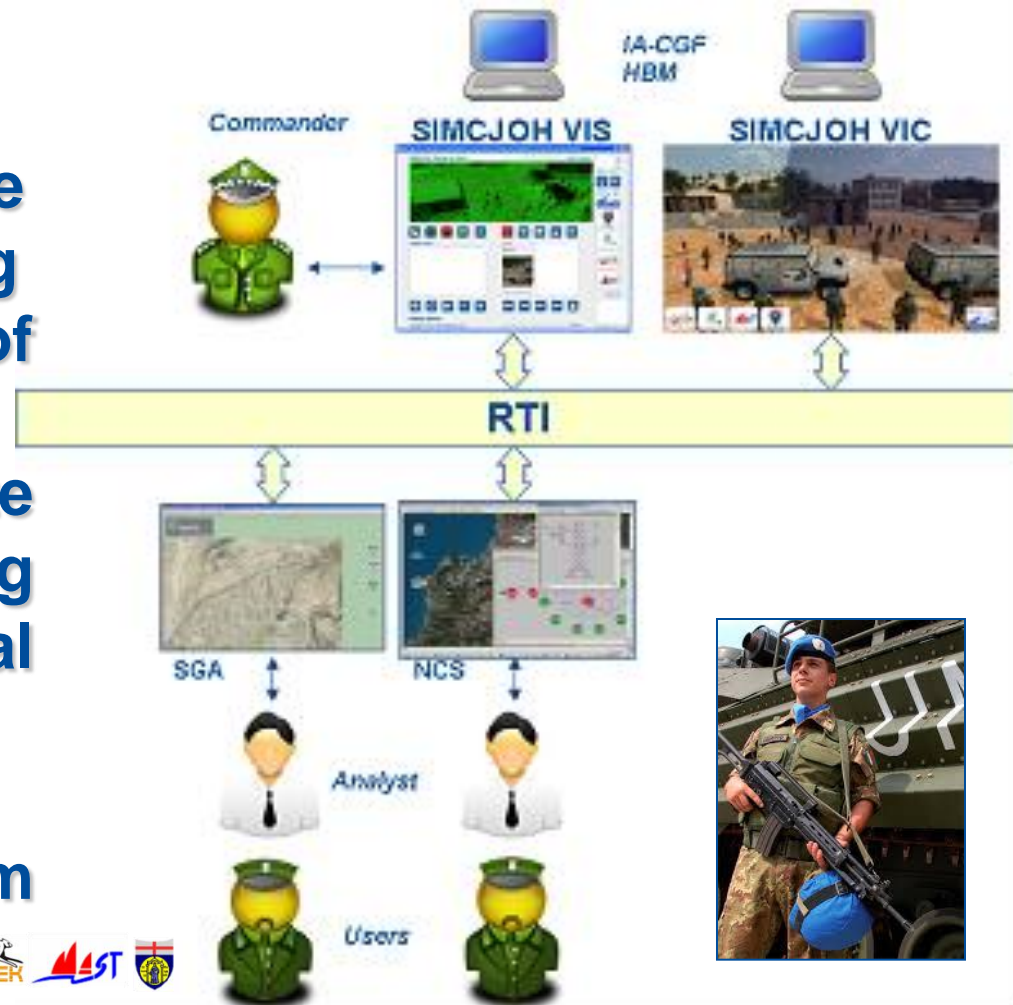
SIMCJOH could be used in federated mode as part of a CAX: people exercising in an entity Simulator (e.g. GESI) interact dynamically with SIMCJOH VIS and VIC managing the complex MEL/MIL and Population Behavior as well as other models (e.g. SGA, NCS).





# Partial Federation for SIMCJOH

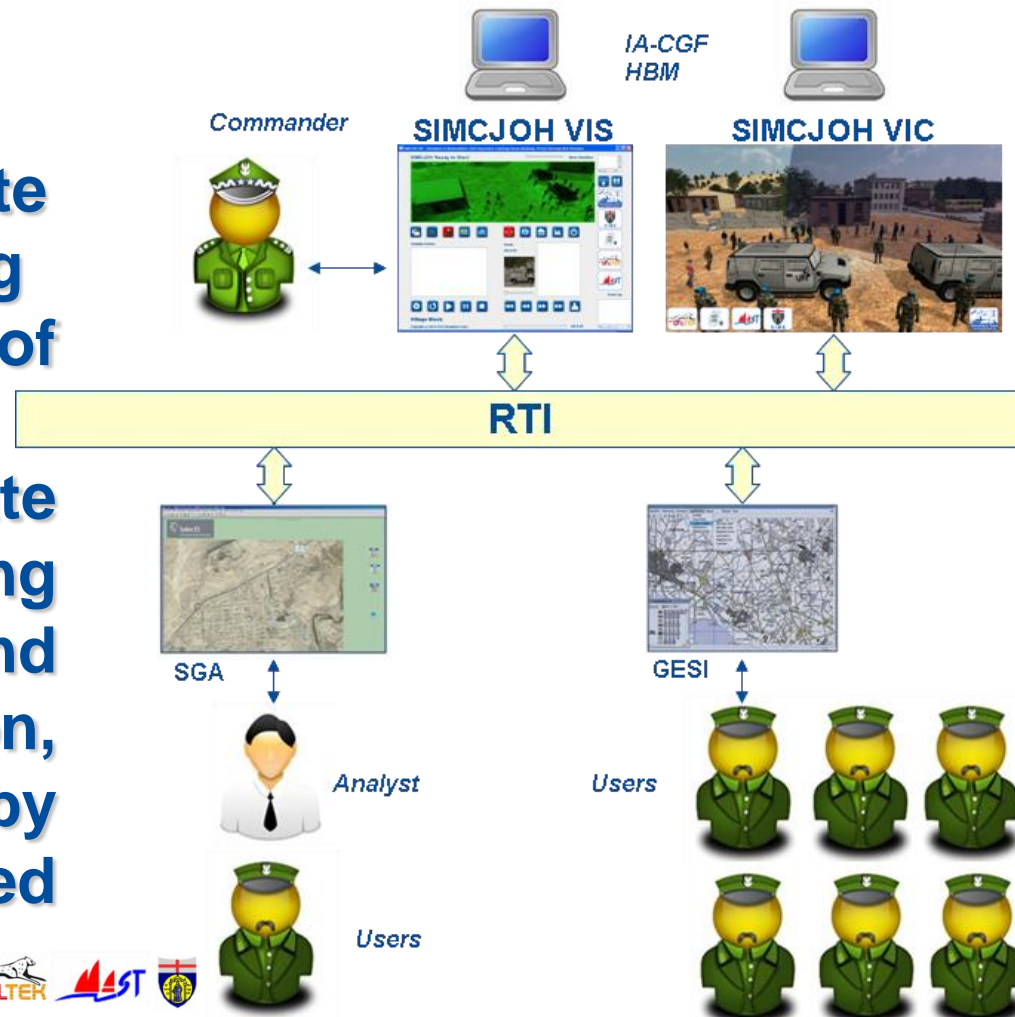
SIMCJOH could operate in federated mode using RTI and just a subset of federated; this provides the possibility to simulate the scenario by using Discrete Event and Virtual Simulation, communication simulation and platform simulation by SGA





# Flexible Configuration of SIMCJOH

SIMCJOH could operate  
In federated mode using  
Different subsets of  
federated; in this case  
it is possible to simulate  
the scenario by using  
both Discrete Event and  
Virtual simulation,  
platform simulation by  
SGA and entity based  
simulation by GESI





# SIMCJOH HBM and IA-CGF

## IA-CGF Federate SIMCJOH\_VIS

- Thanks to the Intelligent Agents (IA-CGF), SIMCJOH is able to let the Commander experience with cross cultural awareness and therefore understanding that the human environment goes through the awareness of cultural differences.
- The IA-CGF federate is incapsulated within SIMCJOH VIS (Virtual Interoperable Simulator); this represents an IA-CGF NCS (Non Conventional Framework) using the IA-CGF previously developed by Simulation Team University of Genoa as an innovative family of Intelligent Agents Computer Generated Forces and able to operate in HLA distributed federation of simulators.
- IA-CGF includes the SIMCJOH models of the entities and the HBM (Human Behavior Models) in order to represent population, interest groups, opposite forces as well as consequence of Commander Actions and to direct the dynamic evolution of the secondary effects on the local population, the military effects and the collateral damages.





# SIMCJOH Virtual Simulation

## SIMCJOH\_VIC Federate

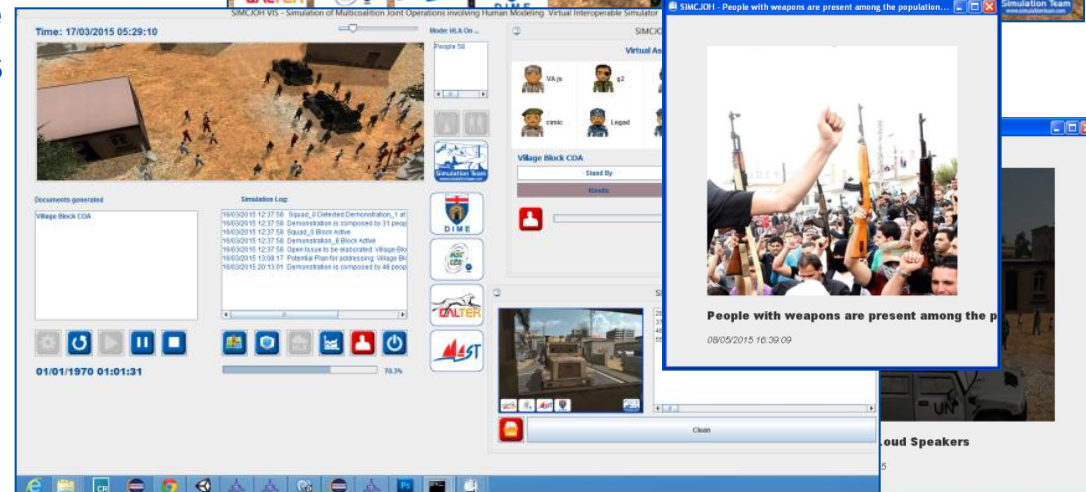
- Virtual Simulation is based on an evolution of the Simulator CTRAIN, that was customized for SIMCJOH and became SIMCJOH\_VIS (Virtual Interoperable Commander) Federate is in charge of providing 3D Virtual Environments in which the Commander can feel the sensation to be directly involved in the military operations. The 3D Virtual Environments is used only at certain points in time (e.g. at the beginning before running the simulation to provide initial information, after selecting the COA to show military and secondary effects of the COA, etc.).
- CTRAIN is a serious game originally developed by MSC-LES UNICAL and CAL-TEK (under the umbrella of the Simulation Team) to train Operators into Military Logistics for Overseas Operations.
- CTRAIN includes the SIMCJOH conceptual models and therefore it has been used to recreate (at certain points in time during the simulation) the 3D representation of the MEL/MIL and its evolution





# SIMCJOH\_VIC & SIMCJOH\_VIS

The commander has the possibility to interact with the virtual environment observing the effects of his actions. However, it should be noted that within the SIMCJOH federation, the commander is allowed to take decision through the SIMCJOH\_VIS simulator (Virtual Interoperable Simulator) and therefore to observe virtually the effects of his decisions within SIMCJOH\_VIC.



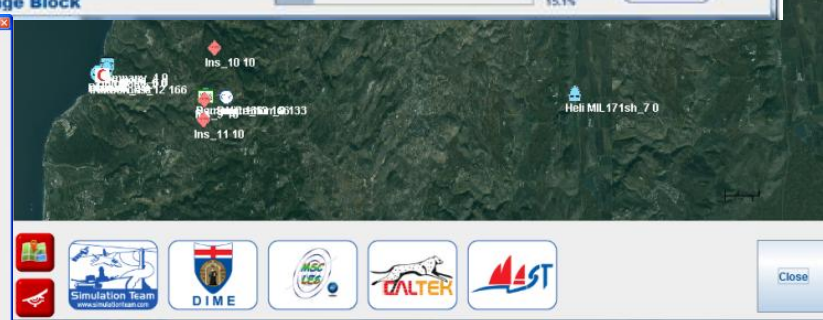
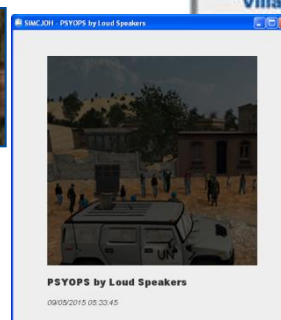
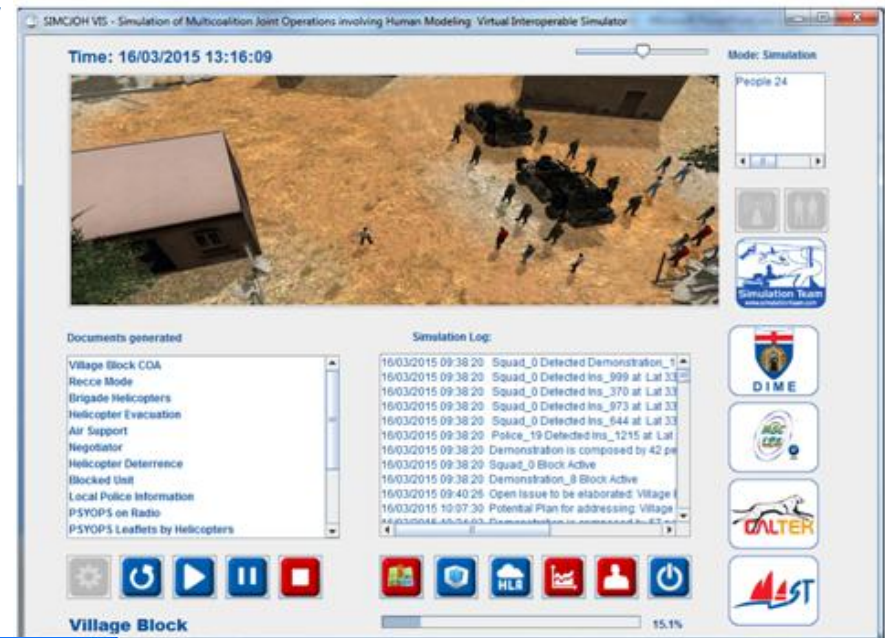


# SIMCJOH\_VIS

Simulation of Multi Coalition Joint Operations involving Human Modeling  
Virtual Interoperable Simulator

SIMCJOH VIS includes Population Model, HBM as well as CGF and Virtual Assistants and provides the interactive framework to receive reports, analyze situation, select decisions and assign high level tasks.

The simulator includes multiple interface able to deal with complex scenario. The demonstration is focused on Village Block into a complex framework.







# SIMCJOH\_VIS Virtual Assistants

Simulation of Multi Coalition Joint Operations involving Human Modeling  
Virtual Interoperable Simulator

The Virtual Assistants allows to support Commander decision maker while the Reporting provides details about scenario evolution considering the different aspects.

SIMCJOH VIS is integrated in SIMCJOH Federation and is interacting dynamically with SIMCJOH VIC for providing Virtual framework.

VIS uses Human Models based on IA-CGF.





# *SIMCJOH\_VIC as part of SIMCJOH uses modes*

The **SIMCJOH\_VIC** (Virtual Interoperable Commander) is one of the simulators that are part of the SIMCJOH federation; in particular, SIMCJOH\_VIC is a simulator that gives the possibility to provide the Commander with a virtual interoperable environment. The SIMCJOH\_VIC simulator run both stand-alone and federated within an federation based on the standard for distributed simulation HLA 1516-2010 Evolved





# SIMCJOH\_VIC MEL/MIL and COAs

SIMCJOH\_VIC is a dedicated framework in which the commander observes the evolution over the time of specific scenarios (MEL/MIL) and Course of Actions (COAs). The current virtual environment includes two small towns, one village and one refugees camp in which the different MEL/MIL and COAs could be applied. This framework was finalized based on MEL/MIL and COAs defined within the SIMCJOH project framework, but could be further extended





## ***SIMCJOH\_VIC Models***

As part of its architecture SIMCJOH\_VIC includes specific models that are used to recreate the scenario and events. To cite a few: the Multi-Coalition models, the real-time Helicopter motion model over 6 degree of freedom, the military vehicles models. In addition, the SIMCJOH\_VIC also includes a number of dedicated animations that are used to reproduce human behavior on the 3D models both for the civilians as well as for the soldiers.





# An Entity Based Simulation in SIMCJOH Federation

## CAE GESI Federate



- GESI is a Constructive Simulator developed by CAE also referred as Command and Staff Trainer (CAST) and operates from company up to division level. GESI is able to represent the mission area, including own and perceived enemy forces, terrain, weather, logistics and the results of any actions (reconnaissance, engagements, casualties, information, etc.) using graphics (simulation), video/audio support and text boxes.
- From the very preliminary phases of the SIMCJOH project, GESI has resulted a suitable integration to the SIMCJOH federation due to its capability to simulate specific situations such as airplane with civilians, hostage situations, damage to buildings, riots, logistics, evacuation and medical support.
- CAE GESI includes the SIMCJOH conceptual models and recreates the overall picture of different MEL/MIL. In the SIMCJOH MEL/MIL context, GESI is used to have a full picture of the operating environment including military, civil forces and population.



## CAE GESI Federate

GESI simulates the overall environment with simulated forces and groups, military and civil forces, NGOs, population, events etc. including:

- airplane with civilians
- hostage situations
- damage to buildings
- evacuation
- medical support
- riots



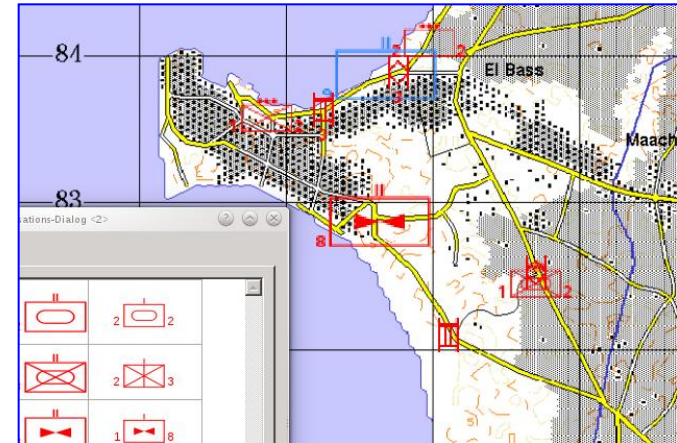
CRC forces in GESI  
interacting with Human



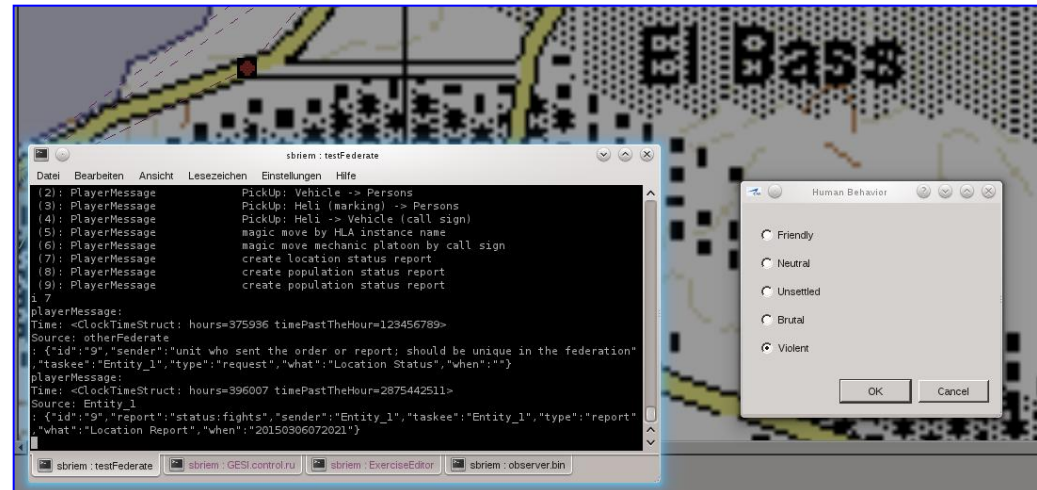
# GESI Simulation

CAE focused on integrating HLA Player Message. PlayerMessage could support several actions such:

- Move
- Pickup
- Location Status
- Population Status
- Status Report
- Alert
- Magic Move



GESI simulated forces around South Eblanon

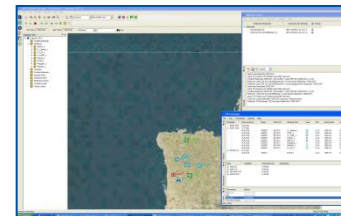




# Platforms & Communications

## Strategic Communications Federate

- The SGA/NCS (Scenario Generator and Animator/Network and Communications Simulator) Federate is a simulator able to recreate networking and communications among all the units involved based on a solution already developed by Finmeccanica (formerly Selex-ES)
- SGA/NCS includes the platform conceptual models; SGA/NCS is used as part of the SIMCJOH federation with the aim of simulating platforms and communications among the Commanderm Headquarter and military units on the field.







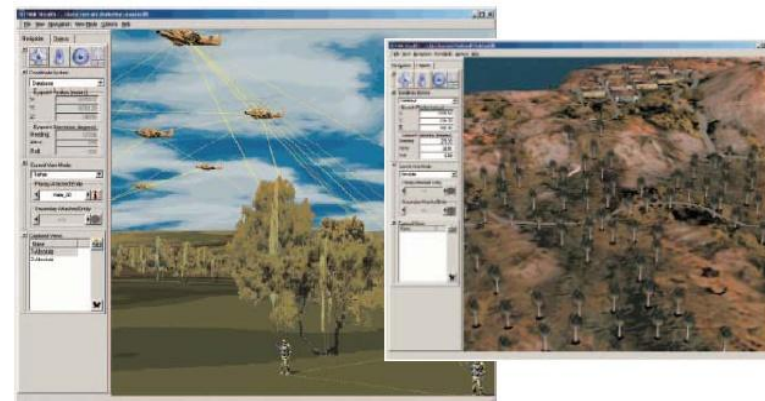
# Network Communication Simulator



- NCS is the Selex ES Modeling and Simulation Solution, built on the Riverbed
- Modeler engine, allowing the users to:

## A) Simulate any operational network asset:

- Sensors fields
- Infrastructural Networks
- Mobile Networks
- Aerial Networks
- Satellite Networks



## B) Analyze:

- Scalability
- Survivability
- Availability and Reliability

## C) Utilize the “State of the art” of Communication and Networking technologies:

- Suite of MANET protocols
- Satellite Communications
- Wireless
- 2D / 3D visualization of communications

## D) Realize (optional module) the “System-in-the-Loop” (SITL) capability that allows for establishing a connection “Live-Constructive” through which the real hardware and the simulation environment interact as a single unified system. This allows for:

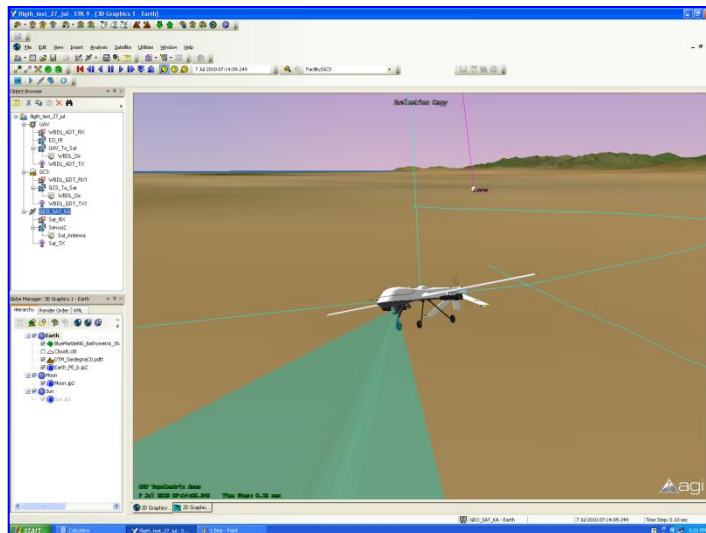
- Analyze effects of a simulated network on a real application
- Utilize simulation as a traffic generator to load real network
- Conduct stress tests on real equipment/application in an environment that simulate operational conditions





# NCS Logic

- ✦ **Discrete Events Simulator** Wired Networks Simulation (ATM, Frame Relay, IP, MPLS), Wireless Networks (Radio and Satellite, Avionic Systems). Optical Networks, Sensors. Capability to model all ISO/OSI stack levels
- ✦ **Libraries of standards equipments** (Switches, Routers, etc.) and Custom Equipments by the most important world suppliers (CISCO, Juniper, Alcatel, Marconi/Fore, Finmeccanica Land and Naval Defence Electronics Division, etc.) All **models are open source (C/C++)** and can be fully customized.
- ✦ **NCS is Modular** and can be scaled according to the Customer needs.



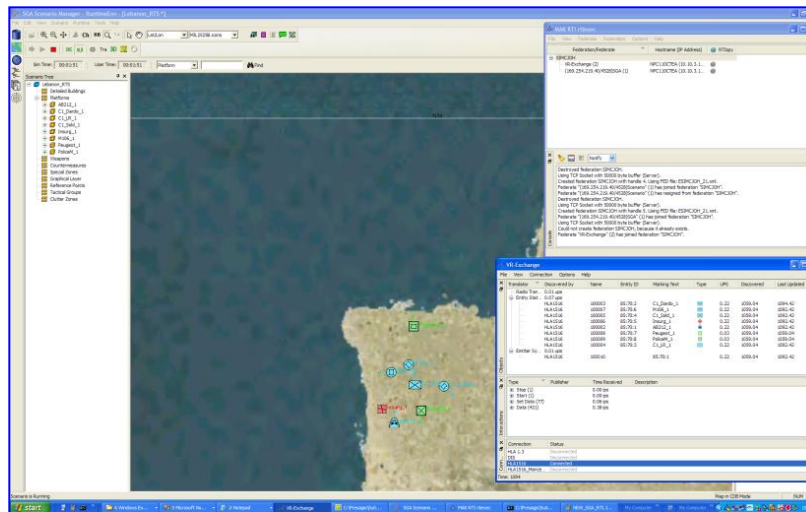
- ✦ **NCS can operate in Synergy** with advanced external Simulation tools like **STK** and MatLab for the best Simulation Fidelity in order to:

- Calculate dynamic Link Budgets
- Validate connections for LOS links
- Calculate parameters for Coverage calculations and link quality optimization
- Produce real-time, high detailed Statistics



# Scenario Generator and Animator (SGA)

The SGA (with the addition of its gateway tool) is the minimal subset of the M&S Control Room that can be used in the SIMCJOH federation in conjunction with NCS in order to add a real-time simulation of specific assets and recreate networking and communications among them. Even for the NCS/SGA federates, they have been adjusted to include the SIMCJOH conceptual models since NCS/SGA, as part of the SIMCJOH federation, is devoted to simulate specific units with SGA federate and, with NCS Federate, the communications between the Commander headquarter and the military units deployed on the field (owned by SGA) or among these units themselves.



In order to fit SIMCJOH requirements and in order to reach integration with other partners, specific customizations has been developed, taking advantage from SGA flexibility.

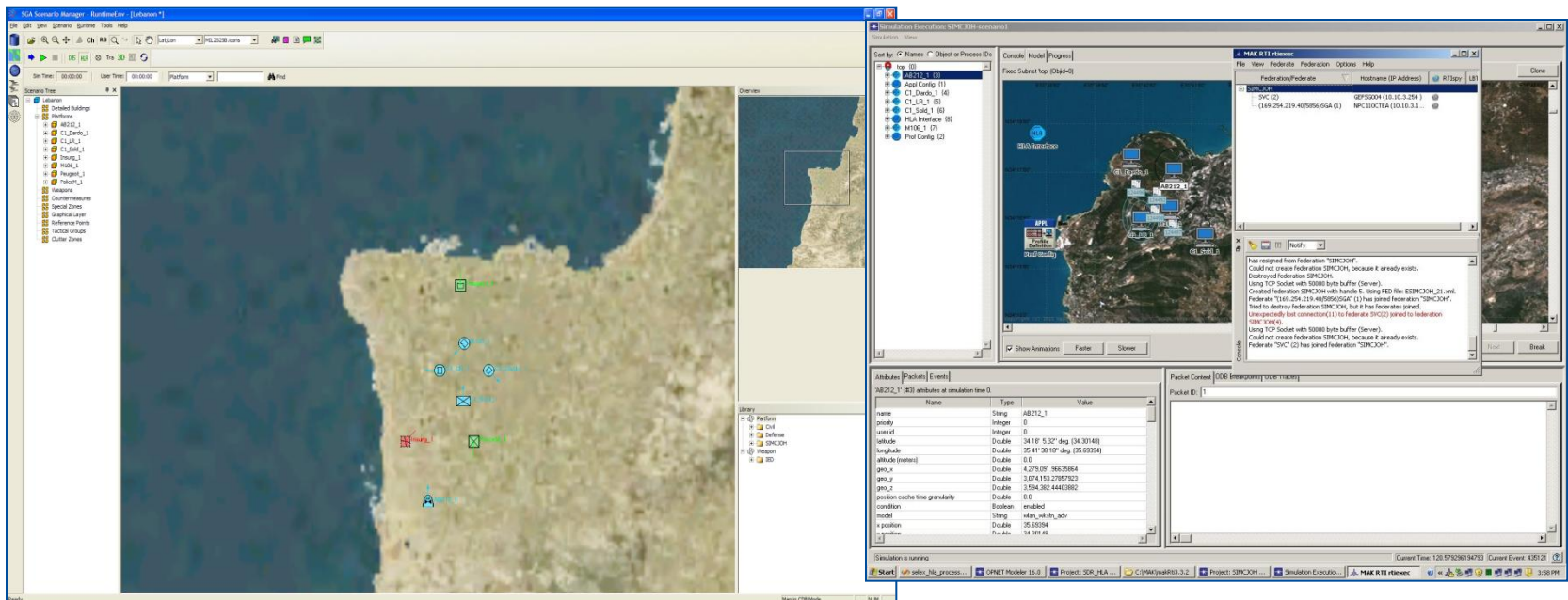




# SGA & Platform Simulation

In order to verify SGA capabilities for SIMCJOH project and requirements satisfaction integrations tests have been performed with NCS component and with support tools.

Main goals reached in SIMCJOH project is the proper cooperation among different types of simulators, each of them working with a different set of data and different time synchronization system. Another interesting feature is to setup an hybrid HLA federation with evolved and not evolved components working together.



The screenshot displays the SIMCJOH simulation environment. The main window shows a 3D map of a coastal region with various objects and entities. The left sidebar contains a 'Scene Tree' with a hierarchical list of objects. The top right shows a 'Federate List' window with columns for Name, Object or Process ID, and RTType. The bottom right shows a console window with error messages related to federate creation and connection.

**Federate List:**

Name	Object or Process ID	RTType
top	0	RTType
AppContig	11	RTType
CL_Drugs	14	RTType
CL_LK	15	RTType
CL_Sig	16	RTType
HLA Interface	18	RTType
MUX	17	RTType
Plot Contig	13	RTType

**Console Window:**

```

You've assigned from Federation "SIMCJOH"
Could not create Federation "SIMCJOH", because it already exists.
Destroyed Federation "SIMCJOH".
Using TCP Socket with 50000 byte buffer (Server).
Created Federation "SIMCJOH" with handle 5. Using FED file: ESIMCJOH_21.xml.
Federation "118.254.219.40/S50505A" (1) has joined Federation "SIMCJOH".
Need to destroy Federation "SIMCJOH", but it has federates joined.
Unexpectedly lost connection (1) to federate SIMC22 joined to Federation "SIMCJOH".
Using TCP Socket with 50000 byte buffer (Server).
Could not create Federation "SIMCJOH", because it already exists.
Federation "SIMCJOH" (2) has joined Federation "SIMCJOH".
  
```

**Attributes Window:**

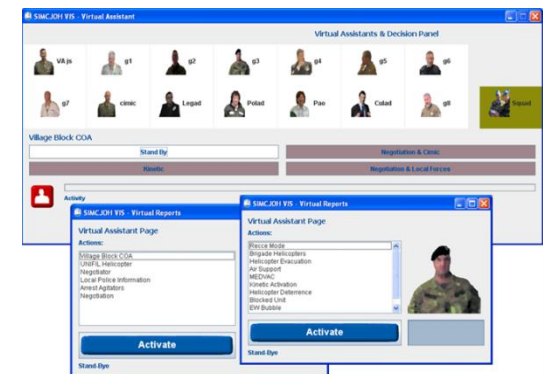
Name	Type	Value
name	String	AB212_1
priority	Integer	0
unit id	Integer	0
latitude	Double	34.11° 5.32' deg (34.30148)
longitude	Double	35.41° 38.10' deg (35.63394)
altitude (meters)	Double	0.0
pos_x	Double	4.279 091 3663984
pos_y	Double	3.074 153 2307823
pos_z	Double	3.594 362 44403802
position cache line granularity	Double	0.0
condition	Boolean	enabled
model	String	mlas_wksh_ach
position	Double	35.63394
priority	Integer	0



# SIMCJOH Use Modes

The SIMCJOH Federation of simulators is characterized by different use modes, therefore there are four different SIMCJOH architecture views that evolved and could be analyzed:

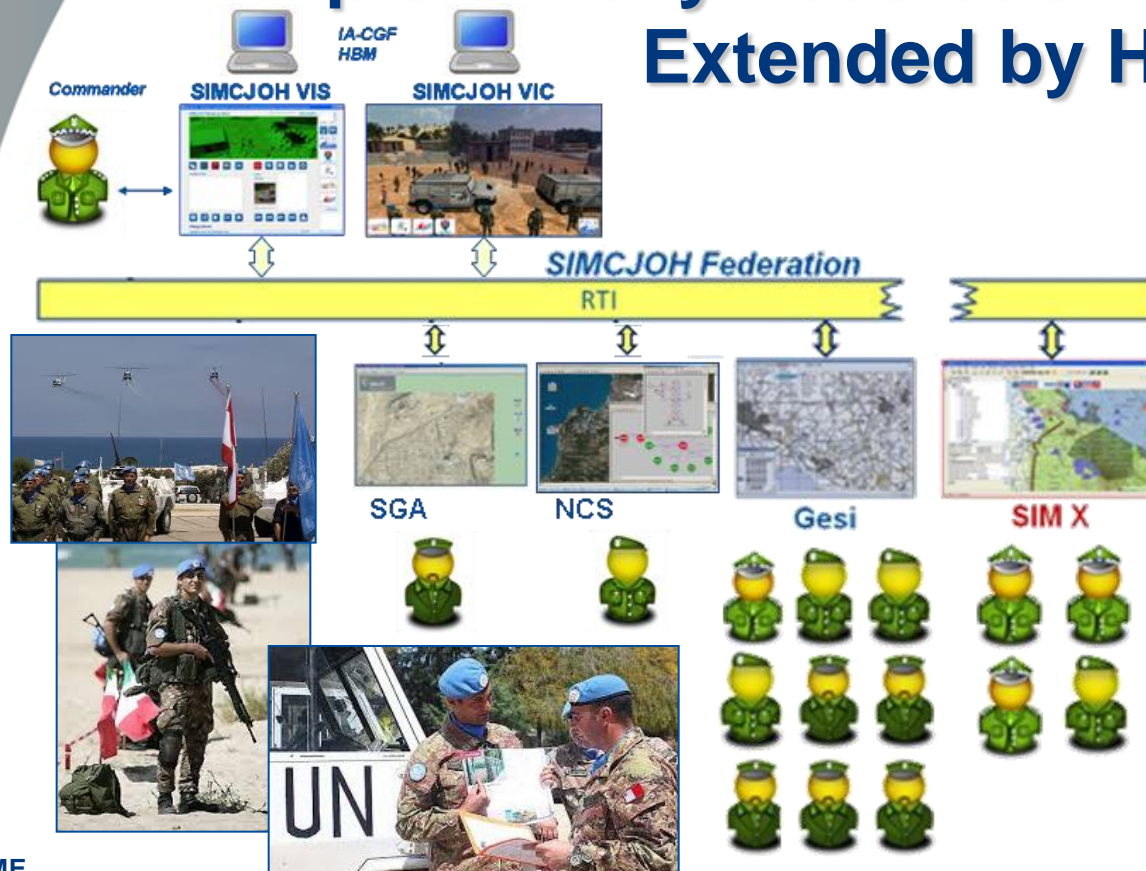
- **Fully Federation Operational Mode**
- **Fully Federation Operational Mode Extended by HLA**
- **Mix Federated Operational Mode**
- **Stand-Alone Operational Mode**





# SIMCJOH Open Architecture

## Example of Fully Federation Operational Mode Extended by HLA



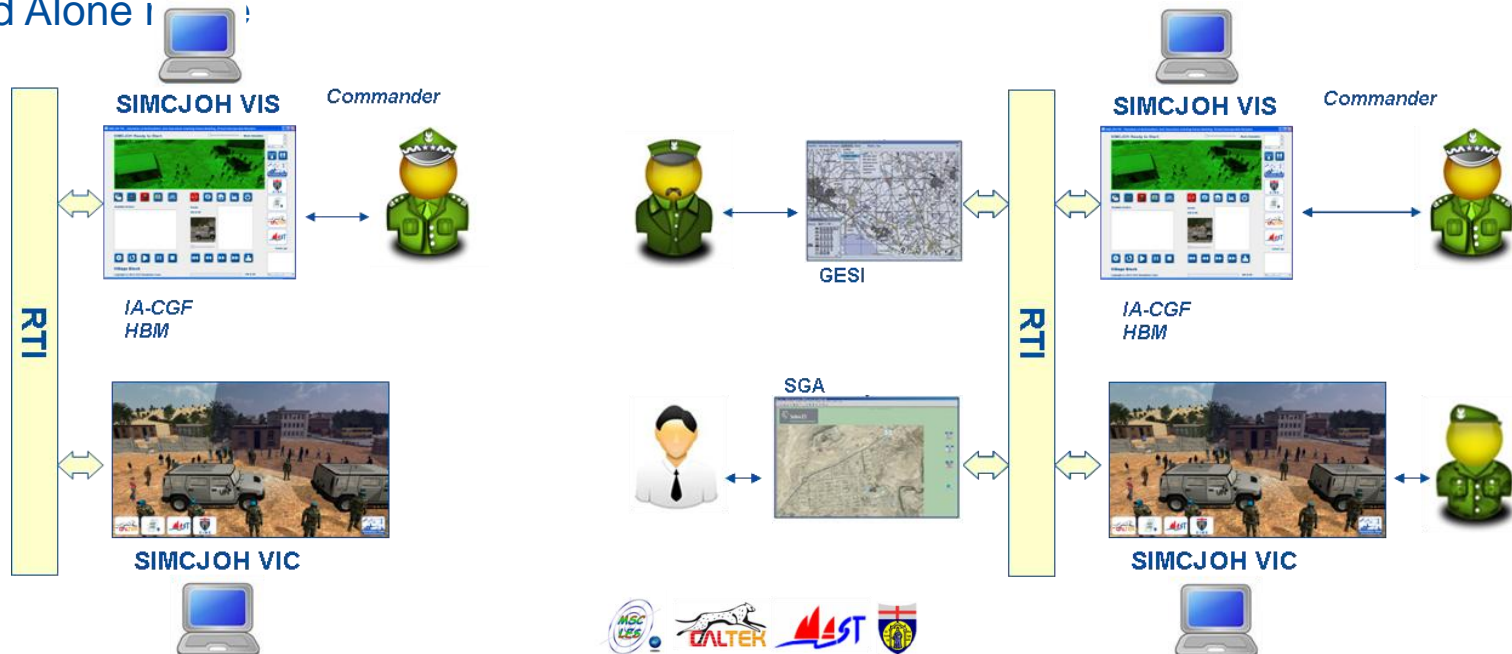
SIMCJOH architecture is based on the HLA standard for distributed simulation. So the SIMCJOH architecture is ready for further development in terms of capability of being integrated with additional federates. This represents a major capability of proposed approach



# SIMCJOH Single Multiuser

## Example of Mix Federated Operational Mode

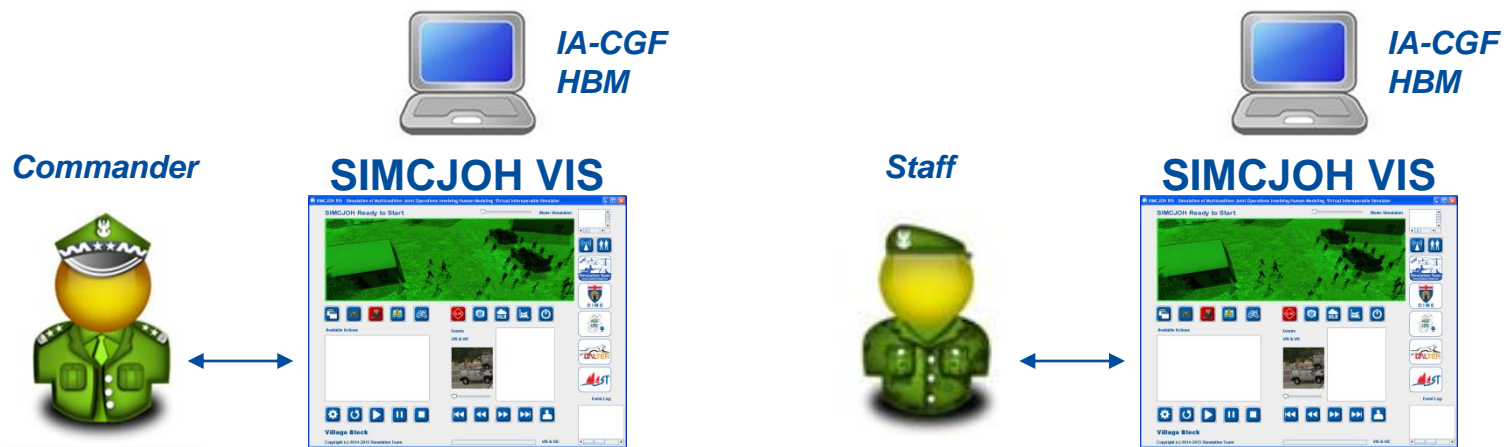
Only some federates are included in the federation; this view is particularly useful to prove the technological capability of SIMCJOH of working as a modular system (with one or more users) that evolves from fully federated and Mix Federated to Stand Alone :





# SIMCJOH Stand Alone

## Example of Stand-Alone Mode



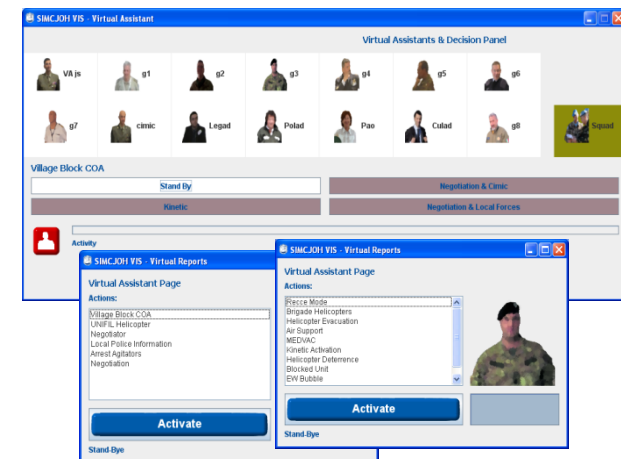
This is the case in which the Commander plays with the SIMCJOH Simulation Model in a standalone way that guarantees a quick and simple use. This approach is devoted to involve the Commander, and his staff, in a self-assessment mode over new mission environments and in scenario familiarization respect to PMSEII issues. Other ones could play independently and then to compare results by using Serious Game engagement strategies





# The SIMCJOH Game Logics

- SIMCJOH provides a user friendly and intuitive mechanism of game play. Preliminary information about the MEL/MIL as well as information about the possible COAs are provided to the user in the form of compact reports
- The use of the 3D Virtual Environments facilitate also the information and knowledge developing phase as well as the understanding of the situation that is used to shape the final decision
- The Commander interacts with his virtual staff (several avatars driven by Intelligent Agents e.g. J1, J2, J3, POLAD, LEGAD, CULAD, etc.)





# SIMCJOH and Eblanon

The main scenario is focused on the Eblanon inspired to United Nation mission in Middle East. The Eblanon scenario fits well the SIMCJOH purposes because it includes military aspects, political, social, economic and religious issues. Indeed, the reasons for the Eblanon choice can be summarized as follows:

- Many political and religious interests
- High presence of foreigners (business, tourism, charities, etc.)
- Economic links with Italy
- Presence of several military organizations
- NATO is interested in monitoring the entire Middle East.



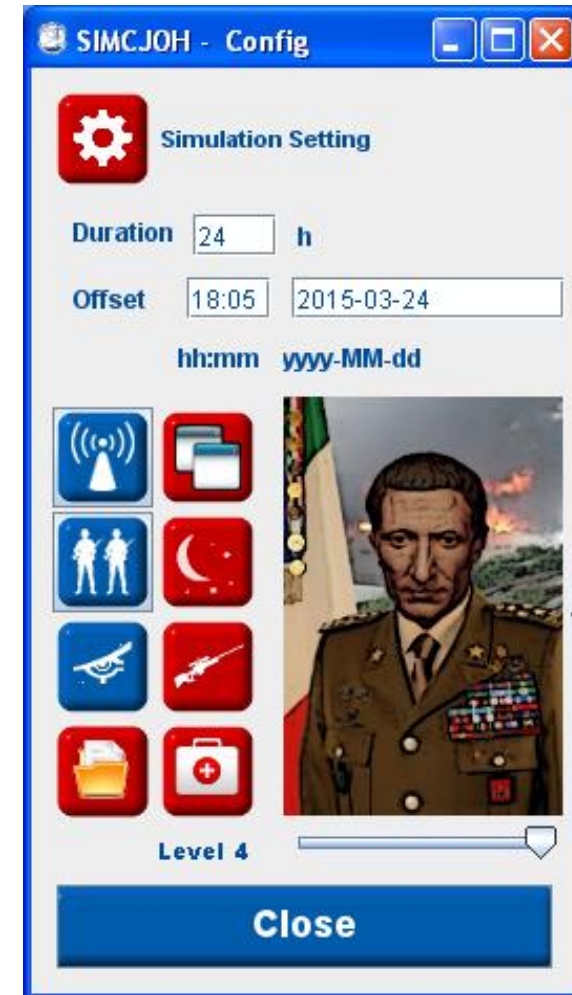


# The SIMCJOH Game Levels

SIMCJOH could operate at different difficulty levels corresponding to different settings (e.g. snipers, Wound in Action, etc); indeed in scenario analysis it was hypothesized that the main scenario of the game could be characterized by different levels:

- Permissive situation
- Semi-permissive situation
- Not permissive situation

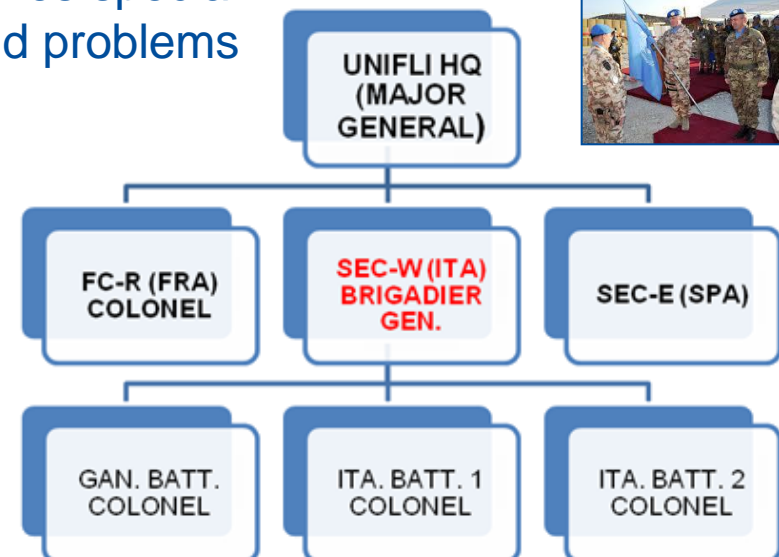
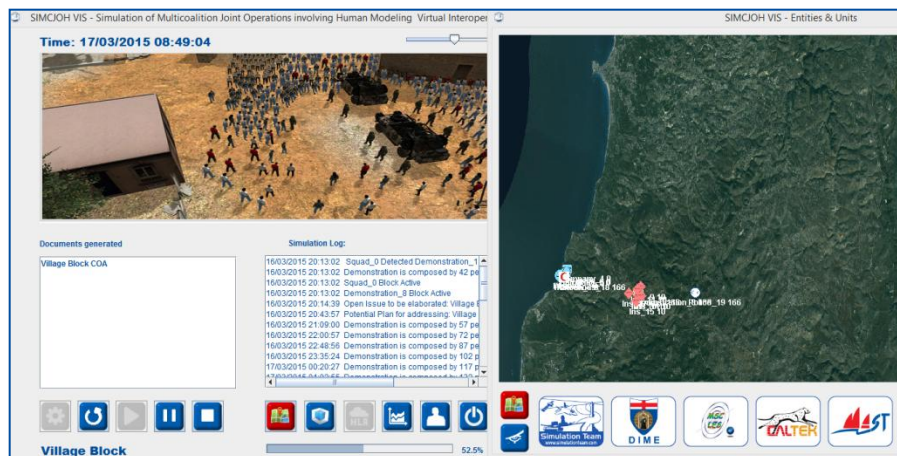
These levels could be applied to SIMCJOH MEL/MIL and therefore they make up the game levels that the user is required to deal with.





# The SIMCJOH Commander within UNIFIL Scenario

The context used is United Nation Mission on a complex context. The hierarchy level considered within the main SIMCJOH scenario is a Brigade with a specific focus on its Commander playing the role of a Commander of an Italian contingent involved in a mission into a foreign nation Eblanon, in Middle East, with different religions, political parties and need support for normalizing the situation. United Nation mandate requires special attention in protecting population and avoid problems





# Game Logic in the main Scenario



- Within the main scenario, the Commander (and his staff) are driven through a multiple steps decision making process.
- According to the selected MEL/MIL, the SIMCJOH Federate generates events and the Commander is required to assess the situation, collect information, create knowledge and shape the final decision by selecting one of the COAs provided by his staff.
- As happens in real situation the Commander may require his staff to provide additional information on each COA with the aim checking COA feasibility, collect additional data, evaluate legal consequences as well as secondary effects on population, etc.

**Situation Report**

**Helicopter Evacuation**  
Wed Feb 03 14:36:59 CET 2016

**COA0: Simply Stand By**

**COA1: Negotiation & CIMIC**  
1) Negotiation & CIMIC

**COA2: Kinetic**  
3) Kinetic

**COA3: Local Police Negotiation**

**SIMCJOH VIS - Virtual Assistant**

Virtual Assistants & Decision Panel

VA js, g1, g2, g3, g4, g5, g6, g7, g8, Legad, Polad, Pao, Cutad, Squad

Village Block COA

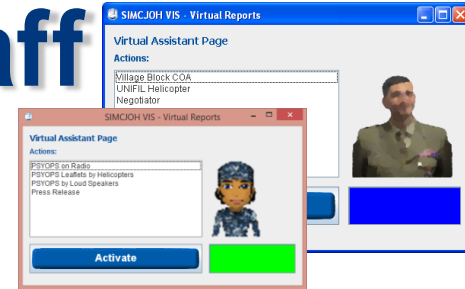
Stand By, Kinetic, Negotiation & Cimic, Negotiation & Local Forces

Activity: Stand-by

Immediate reserve...  
...with...  
...staff...  
...management of the...  
...areas of minor...  
...local assets...  
...counter-propaganda...  
...training CIMIC...  
...to support...  
...the local population...  
...and establish new...  
...SABON



# Commander and Staff



The Commander may interact with his staff in two different ways:

- **Synchronous Activities:** structured actions related to the COAs analysis
- **Asynchronous Activities:** actions such as asking the staff to provide additional data, evaluations, information, etc. that can take place at any moment of the game.

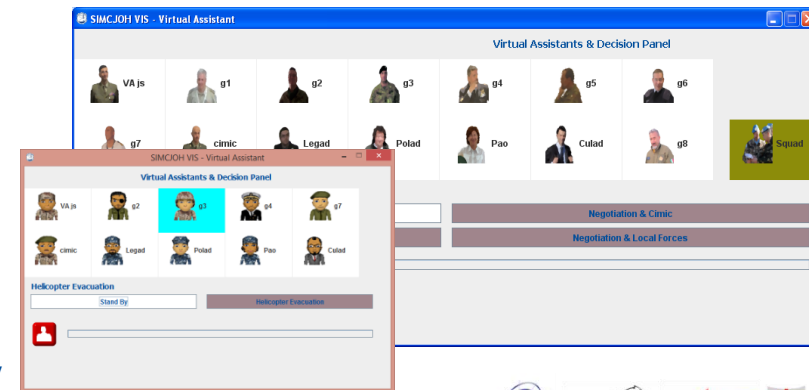
After the COA selection, the discrete event simulation is run and therefore the selected MEL/MIL stochastically evolves according to the COA selected. The SIMCJOH discrete event simulation is able to carry out multiple fast-time replications of the same simulation run and it is able to evaluate Military Effects, Secondary Effects on Population and Risks to get an indication of the Commander Performances.



# SIMCJOH Virtual Assistants

As far as the Commander Staff is concerned, the staff roles included in SIMCJOH involves:

- JCoS: Joint Chiefs of Staff
- G1: Personnel and Manpower
- G2: Intelligence
- G3: Operations
- G4: Logistics
- G5: Strategic Plans and Policy
- G6: Command, Control, Communications and Computers/Cyber
- G7: Operational Plans and Joint Force Development
- G8: Force Structure, Resources, and Assessment
- G9: CIMIC (Civil Military Cooperation)
- Legad: Legal Advisor
- Polad: Political Advisor
- PAO: Public Affair Officer
- Culad: Cultural Advisor



*Commander could interact even with an Agent that provides feedback of the Blocked Squad*



# The SIMCJOH Units: ORBAT

Resources uses for SIMCJOH Demonstration are a subset of Brigade Reserve available to be involved and includes:

## Blue Forces

- Up to 2 NH90
- Up to 2 Companies with VTLM
- Up to 2 Platoon with VTLM
- A CIMIC Unit with ACM90
- Up to 1 Mil171Sh from Ghana

## Local Forces

- Police with Car and P64
- Crescent Red Moon Ambulance

## OPForces Forces

- Up to 20 Ground Units (AK47,NSV, RPG)
- Snipers with AK47

## People

- Demonstration up to 1000 people with Improvised Weapons and/or some AK47



**ORBAT 1320 Brigade**







# The SIMCJOH Conceptual Models: MEL/MIL, COAs

## *MEL/MIL 1: Army Squad Flash Seizure in a Village*

- A Squad of 12 soldiers of a platoon of UNIFLI is stuck in a village during a task force
- The number of people around the squad continues to increase, the squad commander warns that it is not able to move and resolve the situation
- Procedures are activated for units deployment around the village
- Three COAs, named CIMIC, KINETIC, LOCAL FORCES respectively, are included in the MEL/MIL
- The COA description also includes Military Effects, Secondary Effects on Population, Risks deriving from the COA, possible Mitigation Actions.

***MEL/MIL: Master Event List, Master Incident List***

***CIMIC: Civil Military Cooperation***

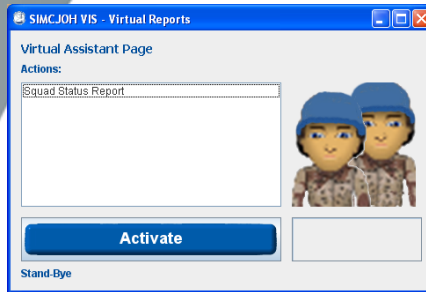
***COA: Course of Action***

***UNIFLI United Nation Force for Large Improvement of Eblanon***

UNCLASSIFIED



# Report on the Village Block



## Situation Report



**SIMCJOH simulator generates automatically reports that dynamically is updated based on the decision and events. By these events including true and false information that could be improved through Recce (Reconnaissance) or Intelligence the Commander should take decisions**

**Village Block.** The area around the village Chamaxa is Safe, but a squad has been seized off the village. Our squad is blocked by population and they require to surrender our weapons to get clearance to leave the village; the squad leader is Failing on the negotiation, the reserve of the regiment is engaged in other military operations, and 2 Platoons and 1 helicopter(s) from the brigade reserve was activated to support the Squad evacuation operations. The village has not received CIMIC Project during the last 3 months. The last CIMIC was Partially Failed for the village inhabitants. The village is characterized by a No presence of Hostile Forces. The village area is Depressed. Religion: Scia. In the past there were Several actions against the UNIFIL contingent during the last 4 months. The village has 2 access way(s). Presence of buildings results in Good opportunity for snipers. The local police Headquarters is 60.5 km away. Reluctance toward video-photographic equipment. □The Area is normally covered by the national radio network. Currently Media are non Present. No Press Released Yet No Coverage by Media Yet. Local Public Opinion Mostly Favorable Domestic Opinion Mostly Favorable Percentage of internet users in the local population. Recorded the presence of genetic pathologies. Squad is Ok. Around 84 people are demonstrating in the area.



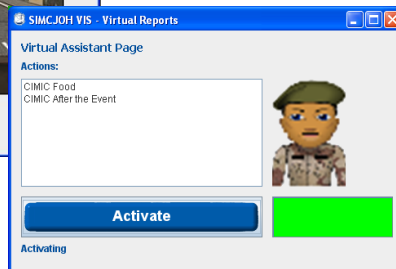
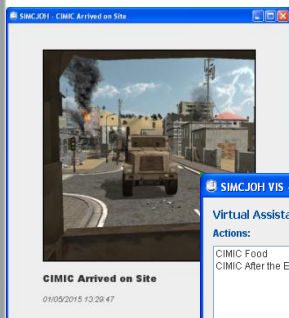
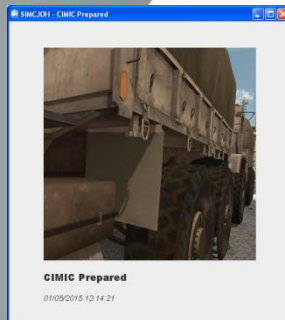


# MEL/MIL1 Village Block

## COA: CIMIC & Negotiation COA



### MEL/MIL1, Village Block: CIMIC COA 1/2



COA	Military effect	Effects on population	Risks	Mitigations
<p><b>CIMIC</b></p> <p>-Introduction of a CIMIC operator for direct Face to Face (F2F) negotiation.</p> <p>-2 Teams for protecting the CIMIC operator</p>	<ul style="list-style-type: none"> <li>- Reduction of the brigade reserve</li> <li>- Insertion of a vehicle for the food kits transportation</li> <li>- Reduced Helicopter transportation capability for the time of the operations</li> </ul>	<ul style="list-style-type: none"> <li>- The presence of helicopters scares the local population</li> <li>- The distribution of food kits will increase the number of people in the area of the event</li> </ul>	<ul style="list-style-type: none"> <li>- Reduction in the capability to satisfy further requests for additional military operations</li> <li>- Reduction of 30% of the helicopter transportation capability</li> </ul>	<ul style="list-style-type: none"> <li>- Immediate reconstitution of the reserve with retired staff</li> <li>- Use of trailers for security teams transportation</li> <li>- Temporary enlargement of the AOO (Area Of Operations) of minor units (company + special assets)</li> </ul>



# MEL/MIL1 Village Block

## COA: CIMIC & Negotiation COA



### MEL/MIL1, Village Block: CIMIC COA 2/2

COA	Military effect	Effects on population	Risks	Mitigations
<ul style="list-style-type: none"> <li>- Availability of food kits to be distributed on-site (100 food kits)</li> <li>- Local Policies and Forces have not been contacted</li> <li>- Two helicopters are available for surveillance operations</li> <li>- Preparation of an official press to support the counterpropaganda (info-ops)</li> </ul>	<ul style="list-style-type: none"> <li>- Concentration of military forces in the village area / reduction of military forces in surrounding areas</li> <li>- The presence of the 2 Squads supporting the CIMIC operator will saturate (in terms of military presence) the area of the event</li> </ul>	<ul style="list-style-type: none"> <li>- General increase of social tension</li> <li>- The F2F negotiation activity could enhance the importance of the local person involved in negotiation (he can be recognized as the leader by the local population)</li> <li>- The massive presence of armed soldiers could induce the local male population to arm themselves</li> <li>- Any flash news broadcasted on the national radio network could negatively affect the population of the village</li> </ul>	<ul style="list-style-type: none"> <li>- Possible reduction of movement capabilities (e.g. the vehicle for food kit transportation is blocked)</li> <li>- Possible exploitation of hostile forces in other areas due to the reduced military presence</li> <li>- Possible loss of credibility at the local level</li> <li>- Negative Media effects</li> </ul>	



# MEL/MIL1 Village Block

## COA: Kinetic COA



## MEL/MIL1, Village Block: KINETIC COA 1/2

COA	Military effect	Effects on population	Risks	Mitigations
<p><b><u>KINETIC</u></b></p> <ul style="list-style-type: none"> <li>- Local Policies and Forces have not been contacted</li> <li>- Two helicopters are available for surveillance operations</li> <li>- Preparation of an official press to support the counterpropaganda (info-ops)</li> <li>- Deployment of a squadron with centaur and anti-riots capabilities</li> </ul>	<ul style="list-style-type: none"> <li>- Reduction of the brigade reserve</li> <li>- Reduced Helicopter transportation capability for the time of the operations</li> <li>- Concentration of military forces in the village area / reduction of military forces in surrounding areas</li> <li>- Possible escalation of social tension can bring to the use of force</li> </ul>	<ul style="list-style-type: none"> <li>- The presence of helicopters scares the local population</li> <li>- General increase of social tension and considerable reduction of the UNIFIL mandate credibility (peacekeeping).</li> <li>- The massive presence of armed personnel induces the male population to arm themselves.</li> <li>- The presence of CIVCAS triggers local demonstration peaceful and non</li> </ul>	<ul style="list-style-type: none"> <li>- Reduction in the capability to satisfy further requests for additional military operations</li> <li>- Reduction of 30% of the helicopter transportation capability</li> <li>- Possible reduction of movement capabilities</li> <li>- Possible exploitation of hostile forces in other areas due to the reduced military presence</li> <li>- Possible loss of credibility at the local level</li> </ul>	<ul style="list-style-type: none"> <li>- Immediate reconstitution of the reserve with retired staff</li> <li>- Temporary enlargement of the AOO (Area Of Operations) of minor units (company + special assets)</li> <li>- Activities of counter-propaganda</li> <li>- Planning of CIMIC operations to support the local population and establish new LIASON</li> </ul>



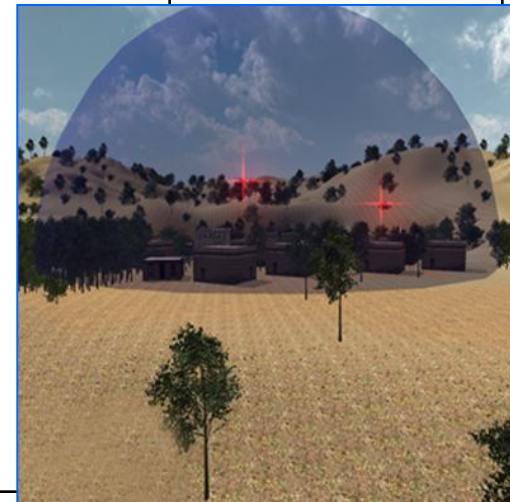
# MEL/MIL1 Village Block

## COA: Kinetic COA



### MEL/MIL1, Village Block: KINETIC COA 2/2

COA	Military effect	Effects on population	Risks	Mitigations
<ul style="list-style-type: none"> <li>- Use of loud speaker assets (PSY-OPS)</li> <li>- Use Special Operation Forces assets for people evacuation</li> <li>- Interruption radio transmission capacity for the time of the operation</li> <li>- Immediate release of a press release</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced capability of maneuvering</li> <li>- Military Losses</li> <li>- Civilian casualties (CIVCAS)</li> <li>- Revelation of PSY-OPS capabilities (Community Outreach)</li> <li>- Possible preventive detention of hostile people</li> <li>- Presence of collateral damage (to goods and things)</li> </ul>	<ul style="list-style-type: none"> <li>- The revelation of the PSY-OPS capabilities will be properly used for counter-propaganda aimed at discrediting the UNIFIL action</li> <li>- Any flash news broadcasted on the national radio network could negatively affect the population of the village (if radio transmission are not interrupted)</li> <li>- Increased contentious for damages caused by the military operations</li> <li>- Worsening of the relations with local authorities</li> </ul>	<ul style="list-style-type: none"> <li>- Negative Media effects</li> </ul>	





# MEL/MIL1 Village Block COA: Local Forces COA



## MEL/MIL1, Village Block: LOCAL FORCES COA 1/1

COA	Military effect	Effects on population	Risks	Mitigations
<b>LOCAL FORCES</b> <ul style="list-style-type: none"> <li>- Local forces have been contacted and informed</li> <li>- Preparation of a press release for the counter-propaganda (info-ops)</li> <li>- Insertion of a CIMIC operator to assist negotiation conducted by local police authorities</li> <li>- Insertion of 2 Squads to protect the CIMIC operator</li> <li>- Provide support to the local forces by using the brigade reserve in case of extreme support</li> </ul>	<ul style="list-style-type: none"> <li>- Reduction of the brigade reserve</li> <li>- Reduction of manoeuvring capability</li> <li>- Possible preventive detention of hostile people from the Local Forces</li> <li>- The presence of the 2 Squads will saturate the area of the event</li> </ul>	<ul style="list-style-type: none"> <li>- General increase of social tension</li> <li>- The presence of local forces has a positive impact on the population</li> <li>- Improvement of the relations with local authorities</li> <li>- The F2F negotiation activity could enhance the importance of the local person involved in negotiation (he can be recognized as the leader by the local population).</li> <li>- Flash news on national radio network could adversely affect the population of the village</li> </ul>	<ul style="list-style-type: none"> <li>- Reduction in the capability to satisfy further requests for additional military operations</li> <li>- Possible reduction of movement capabilities</li> <li>- Possible exploitation of hostile forces in other areas due to the reduced military presence</li> <li>- Possible loss of credibility at the local level</li> <li>- Effects of media</li> <li>- Possible escalation of tension till the use of force</li> </ul>	<ul style="list-style-type: none"> <li>- Immediate reconstitution of the reserve with retired staff</li> <li>- Temporary enlargement of the AOO (Area Of Operations) of minor units (company + special assets)</li> <li>- Activities of counter-propaganda</li> <li>- Planning CIMIC operations to support the local population and establish new LIASON</li> </ul>



# SIMCJOH Conceptual Models For MEL/MIL2

## MEL/MIL 2: Special Forces raids



**This second MEL/MIL was defined and related conceptual models were developed**

- In the area of southern Eblanon there was an incoming flow of refugees from Yrsia. The migration is supported by friends and relatives that accommodate refugees in their own homes. Incidents related to violations of the buffer zone by the Sriael special forces also occur. Such violations continue to increase taking advantage of the current flow of refugees.
- Three different COAs are proposed, namely DETERRENCE, MIXED, TRAINING/SUPPORT TO LOCAL FORCES.





# MEL/MIL2 Deterrence COA

## MEL/MIL 2: Special Forces raids



**General Overview** In the area of southern Eblanon there is an ongoing flow of refugees from Yrsia. The migration is supported by friends and relatives that accommodate the refugees in their homes. The continuous conflict increases the flow of refugees exponentially. Possible presence of terrorists within the flow of refugees. International organizations are present in the area such as the UNHCR (United Nations High Commission Refugees) and other IO and NGO. There is a shortage of water for basic needs and services. Possible social tensions because of labor shortages. Political favorable/unfavorable to the flow of refugees and related actions carried out by the local force of police.

**Particular situation** Increase of incidents related to violations of the buffer zone by Sriaeli special forces taking advantage of the current conditions of the area.

**Mission** Guarantee the inviolability of the buffer zone in order to restore UNIFIL contingent credibility while ensuring, at the same time, the humanitarian emergency management related to the flow of refugees.



# COAs for MEL/MIL2: Deterrence



## MEL/MIL 2: Special Forces Raids

### DETERRENCE COA 1/2

COA	Military effect	Effects on population	Risks	Mitigations
<b>Deterrence</b> <ul style="list-style-type: none"> <li>- Deployment of the UN forces along the blue line</li> <li>- Activation of a plan for aerial surveillance (with helicopters) over Sriael</li> <li>- Patrolling activities along the main routes</li> <li>- Supply of water and food kits to refugees camps</li> </ul>	<ul style="list-style-type: none"> <li>- Reorganization of the UNIFIL contingent</li> <li>- Greater logistic support for the transportation of food and water</li> <li>- Reduction of the helicopter transportation capability</li> <li>- Reduction of the manoeuvring capability</li> <li>- Reduction of the logistic capabilities</li> </ul>	<ul style="list-style-type: none"> <li>- General increase of social tension</li> <li>- media news could negatively affect the population of the area.</li> <li>- Loss of credibility of the mandate of UNIFIL</li> <li>- Change in attitude of the local population against the Irsyans (due to reduction of primary goods).</li> <li>- Loss of credibility of local forces / Increase credibility of Hezbollah</li> </ul>	<ul style="list-style-type: none"> <li>- Increase of possible conflicts with Sriaeli units and local population</li> <li>- Reduction of 30% of the helicopter transportation capability</li> <li>- Reduction in the capability to satisfy further requests</li> <li>- Possible reduction of movement capabilities</li> </ul>	<ul style="list-style-type: none"> <li>- Activation of bilateral talks</li> <li>- Activation of a Key Leader Engagement plan with Local Authorities at different levels</li> <li>- Activation of Liaison activities with IO and NGO</li> <li>- Temporary enlargement of the AOO (Area Of Operations) of minor units (company + special assets)</li> </ul>



# COAs for MEL/MIL2: Deterrence

## MEL/MIL 2: Special Forces Raids

### DETERRENCE COA 2/2



COA	Military effect	Effects on population	Risks	Mitigations
<ul style="list-style-type: none"> <li>- Communication activities in order to maintain the credibility of UNIFIL</li> <li>- Construction of a CIMIC area between the buffer zones and the refugees camps</li> <li>- Activation of LIASONS with the local forces</li> <li>- MEDCAP (medical procedures) for refugees</li> <li>- Reachback capability for conducted the CIMIC activities (e.g. additional resources come directly from Italy to support and carry out CIMIC activities)</li> </ul>	<ul style="list-style-type: none"> <li>- Limited CIMIC capacity in areas not affected by the refugees problem</li> <li>- Exploitation by Hezbollah that works to rearm themselves</li> </ul>	<ul style="list-style-type: none"> <li>- General increase of social tension</li> <li>- media news could negatively affect the population of the area.</li> <li>- Loss of credibility of the mandate of UNIFIL</li> <li>- Change in attitude of the local population against the Irsyans (due to reduction of primary goods).</li> <li>- Loss of credibility of local forces / Increase credibility of Hezbollah</li> </ul>	<ul style="list-style-type: none"> <li>- Possible exploitation by hostile forces in other areas due to the reduced military presence</li> <li>- Possible loss of credibility at local level</li> <li>- Effect of media</li> <li>- Possible escalation of tension up to the use of force</li> </ul>	<ul style="list-style-type: none"> <li>- Activation of the INFO-OPS / PSY-OPS plans for counter-propaganda</li> <li>- Planning of CIMIC activities to support local population and establish new LIASON</li> <li>- Activities of hidden surveillance</li> </ul>



# COAs for MEL/MIL2: Mixed COA





## MEL/MIL 2: Special Forces raids MIXED COA 1/2

COA	Military effect	Effects on population	Risks	Mitigations
<b>Mixed (Deterrence &amp; Training)</b> <ul style="list-style-type: none"> <li>- Deployment of UN forces along the blue line</li> <li>- Training and mentoring activities to the local police forces</li> <li>- Patrolling activities along the main routes</li> <li>- Support to the local police forces for the supply of water and food kits to refugees</li> <li>- Communication activities in order to maintain the credibility of UNIFIL</li> </ul>	<ul style="list-style-type: none"> <li>- Logistic support and training to the local police forces</li> <li>- Partial reduction of the logistics capabilities of the UNIFIL contingent</li> <li>- Exploitation by Hezbollah that works to rearm themselves.</li> <li>- Reorganization of the UNIFIL contingent</li> <li>- Reduction of the manoeuvring capability</li> </ul>	<ul style="list-style-type: none"> <li>- General increase of social tension</li> <li>- Media news could negatively affect the local population</li> <li>- Partial loss of credibility of the mandate of UNIFIL</li> <li>- Change in attitude of the local population against the Isryans (due to reduction of primary goods)</li> <li>- Increase credibility of local forces / Increase credibility of Hezbollah</li> </ul>	<ul style="list-style-type: none"> <li>- Increase of possible local conflict activities</li> <li>- Reduction in the capability to satisfy further requests</li> <li>- Possible reduction of movement capabilities</li> <li>- Effect of media</li> <li>- Possible exploitation by hostile forces in other areas due to the reduced military presence</li> <li>- Possible escalation of tension up to the use of force</li> </ul>	<ul style="list-style-type: none"> <li>- Activation of the bilateral talks</li> <li>- Activation of Key Leader Engagement plans with Local Authorities at different levels</li> <li>- Activation of Liaisons activities with IO and NGO</li> <li>- Activation of INFO-OPS / PSY-OPS plans for counter-propaganda in favor of the local police forces</li> </ul>



# COAs for MEL/MIL2: Mixed COA

## MEL/MIL 2: Special Forces raids MIXED COA 2/2

COA	Military effect	Effects on population	Risks	Mitigations
<ul style="list-style-type: none"> <li>- Activation of Liaisons with the local forces</li> <li>- MEDCAP (medical procedures) for refugee taking care of available on site resources</li> <li>- Arrival of trainers from motherland</li> </ul>				<ul style="list-style-type: none"> <li>- Enlargement of the AOO (Area Of Operations) of minor units (company + special assets)</li> <li>- Activities of hidden surveillance</li> </ul>



# COAs for MEL/MIL2: Training & Supply to Locals

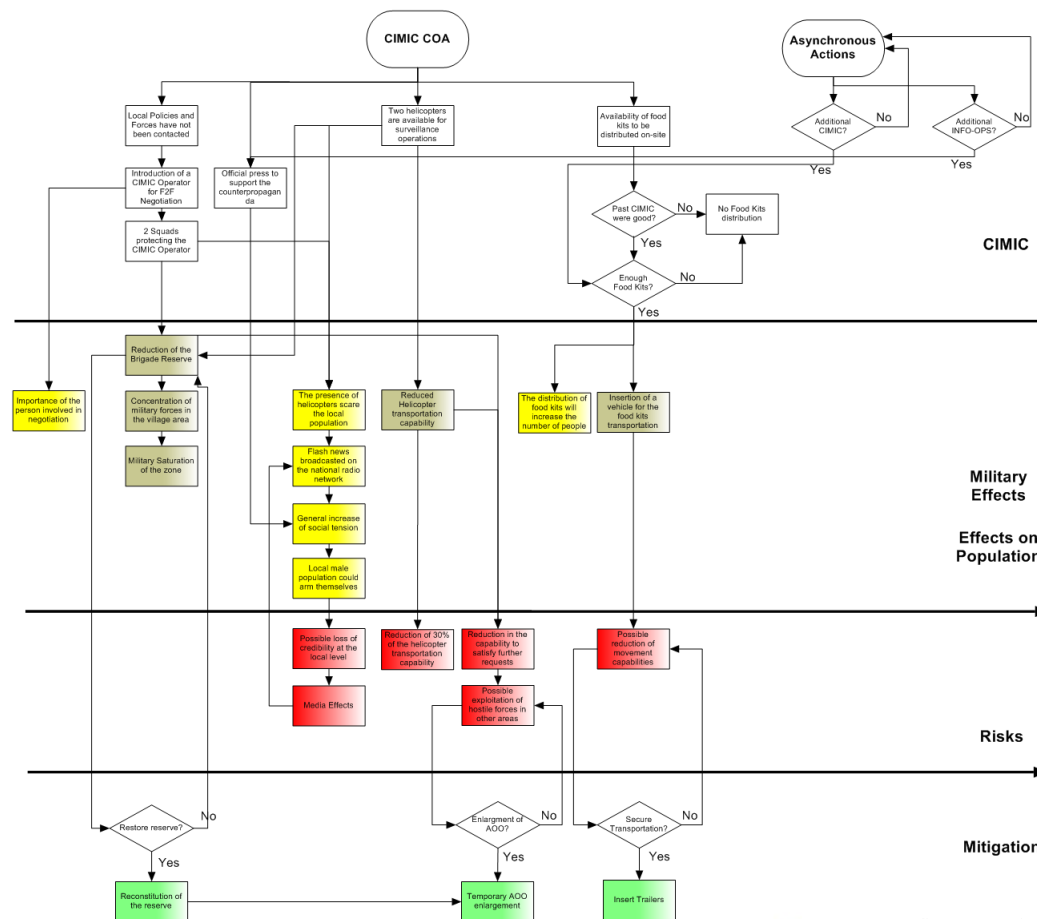
## MEL/MIL 2: Special Forces raids Training/Support to Local Forces COA 1/1



COA	Military effect	Effects on population	Risks	Mitigations
<ul style="list-style-type: none"> <li>- Training/Support to Local Forces</li> <li>- Training and mentoring activities to Local Police Forces</li> <li>- Patrolling along the main train routes</li> <li>- Support to the Local police Forces for the supply of water and food kits to refugees</li> <li>- Communication activities in order to maintain the credibility of UNIFIL</li> <li>- Activation of Liaisons with the local police forces</li> <li>- MEDCAP (medical procedures) for refugee taking care of available on site resources</li> <li>- Arrival of trainers from motherland</li> </ul>	<ul style="list-style-type: none"> <li>- Logistic support and training to the local police forces</li> <li>- Partial reduction of the logistics capabilities of the UNIFIL contingent</li> <li>- Exploitation by Hezbollah that works to rearm themselves.</li> </ul>	<ul style="list-style-type: none"> <li>- General increase of social tension</li> <li>- Media news could negatively affect the population of the area</li> <li>- Partial loss of credibility of the mandate of UNIFIL</li> <li>- Change in attitude of the local population against the Isrians (due to reduction of primary goods).</li> <li>- Increase credibility of local forces</li> </ul>	<ul style="list-style-type: none"> <li>- Partial increase of possible activities of local conflict</li> <li>- Reduction in the capability to satisfy further requests</li> <li>- Possible reduction of movement capabilities</li> <li>- Media effects</li> </ul>	<ul style="list-style-type: none"> <li>- Activation of the bilateral talks</li> <li>- Activation of a Key Leader Engagement plans with Local Authorities at different levels</li> <li>- Activation of Liaisons activities with IO and NGO</li> <li>- Activation of INFO-OPS / PSY-OPS plans of counter-propaganda in favor of the local police forces</li> </ul>



# The MEL/MIL Conceptual Models Based on Flow Charts (1)

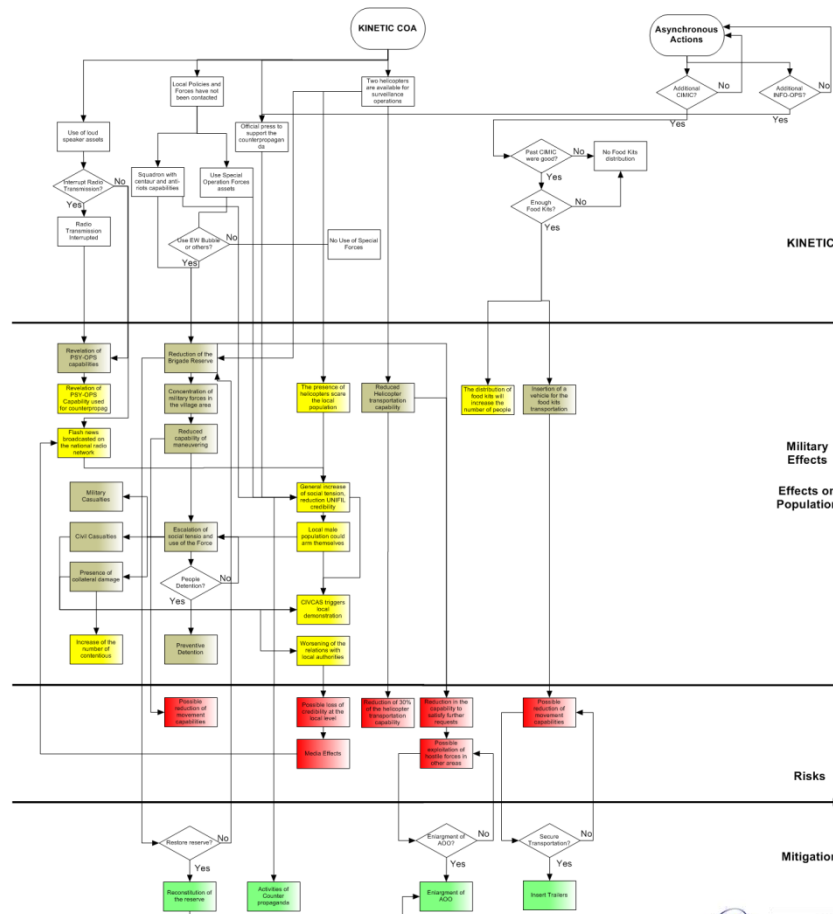


## MEL/MIL1 Village Block: CIMIC COA

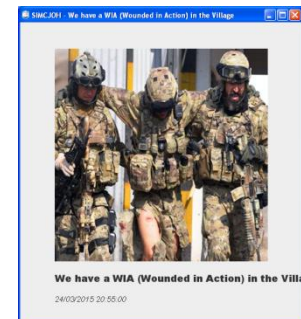




# The MEL/MIL Conceptual Models Based on Flow Charts (2)



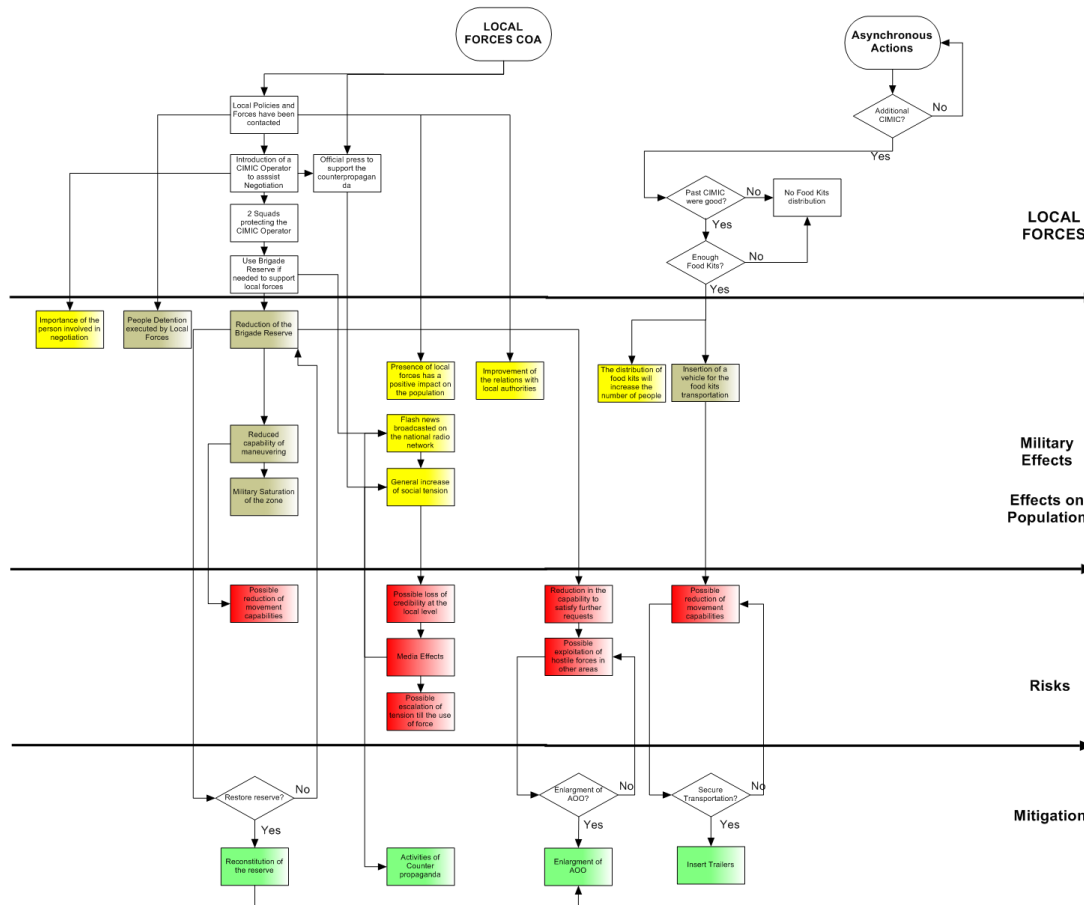
## MEL/MIL1 Village Block: KINETIC COA







# The MEL/MIL Conceptual Models Based on Flow Charts (3)

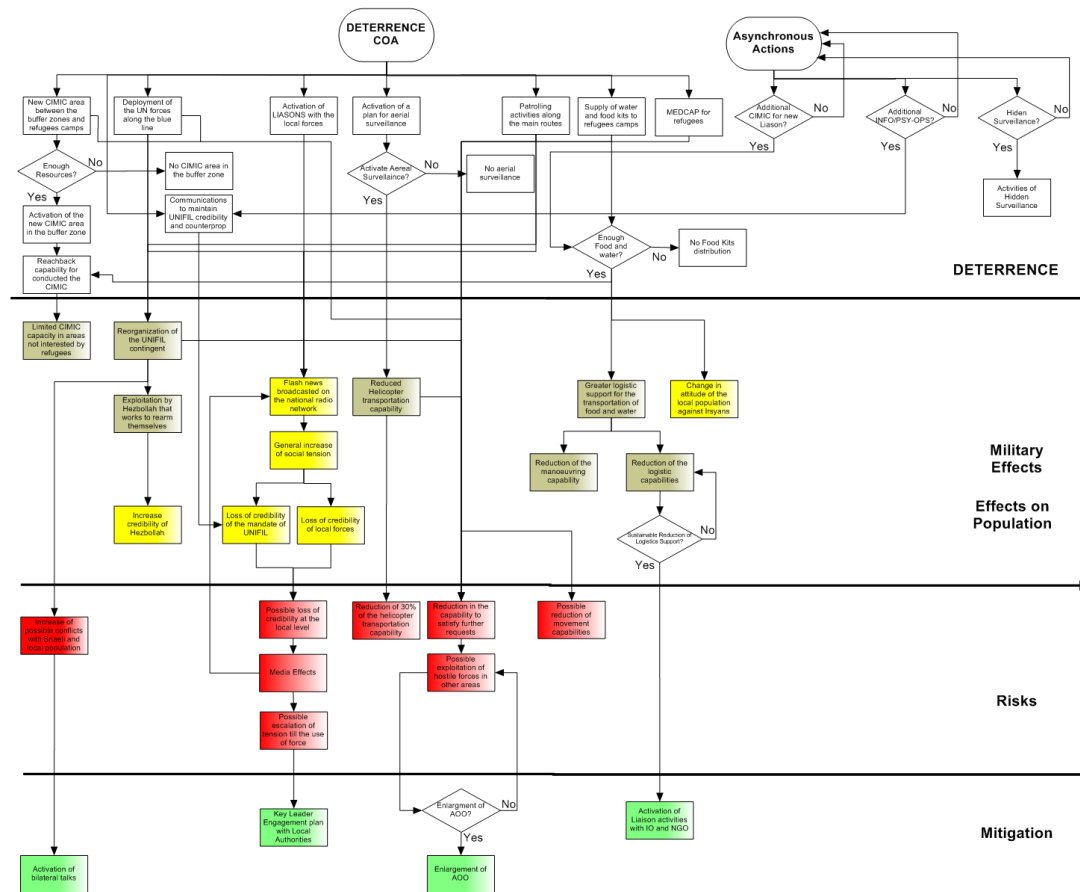


## MEL/MIL1 Village Block: LOCAL FORCES COA





# The MEL/MIL Conceptual Models Based on Flow Charts (4)

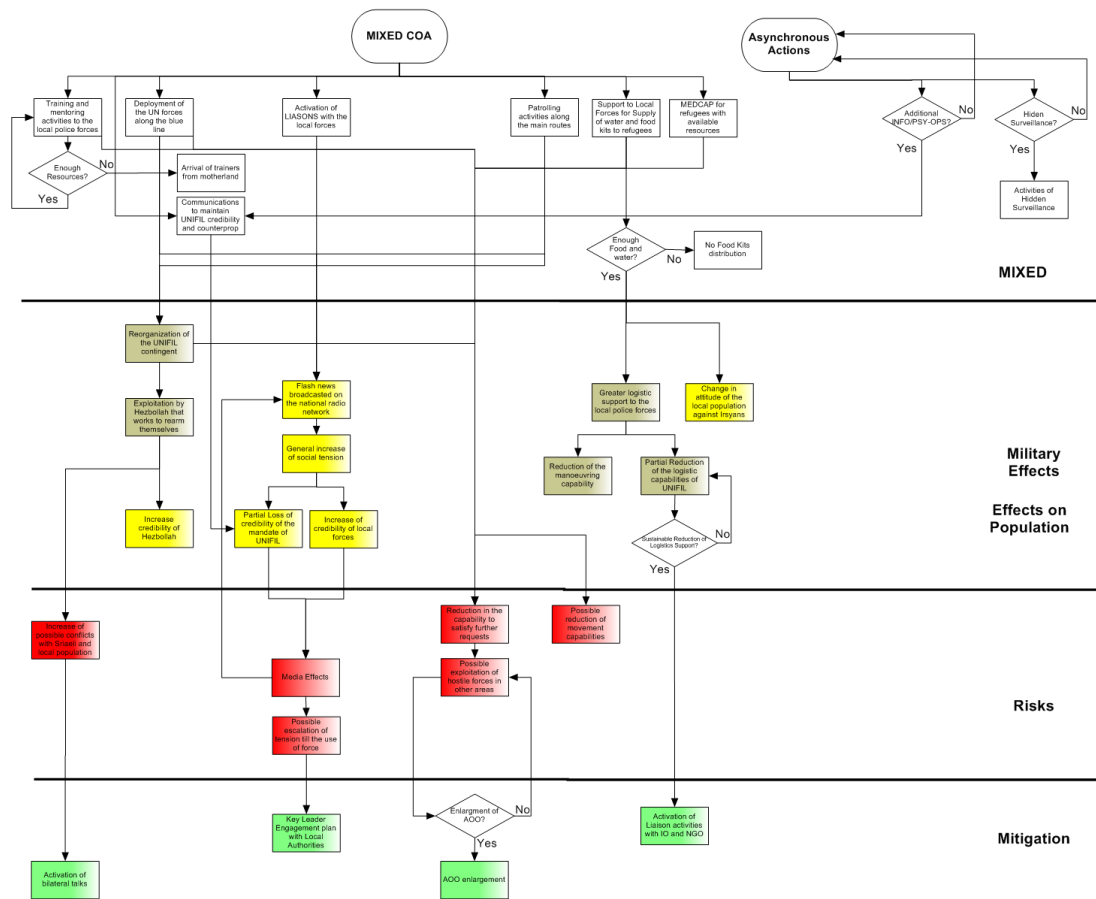


## MEL/MIL 2 Special Forces raids DETERRENCE COA





# The MEL/MIL Conceptual Models Based on Flow Charts (5)

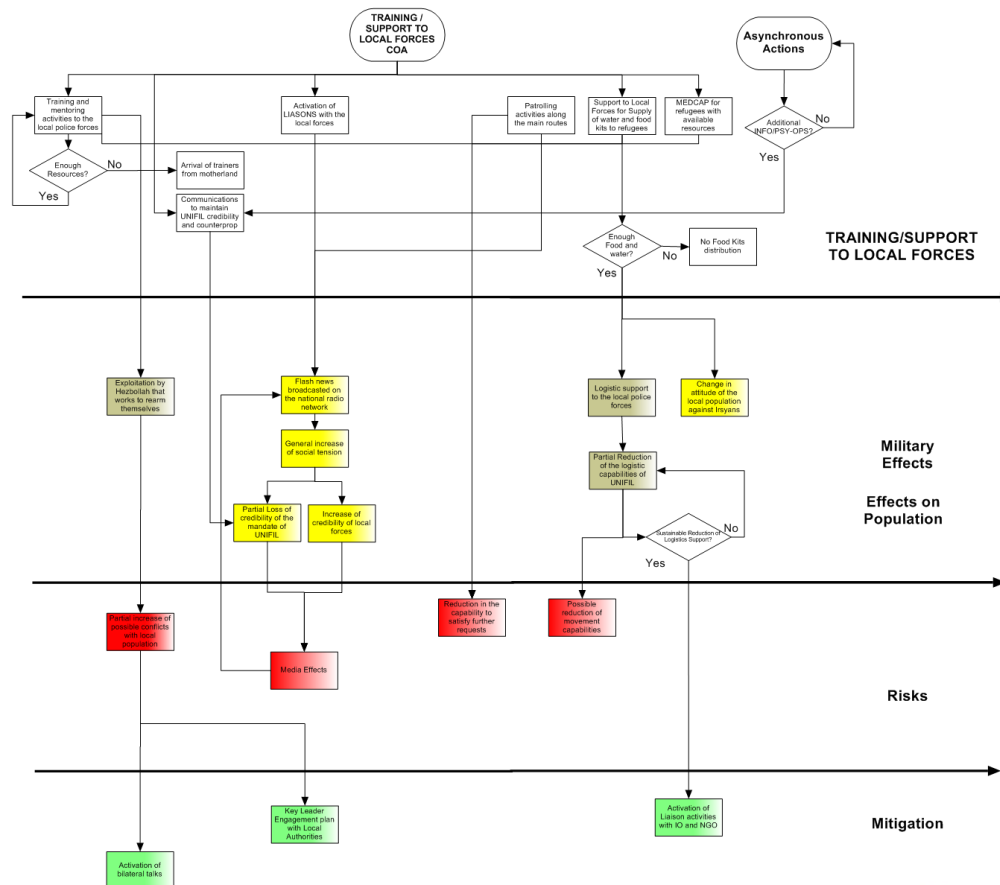


**MEL/MIL 2**  
**Special Forces**  
**raids**  
**MIXED COA**

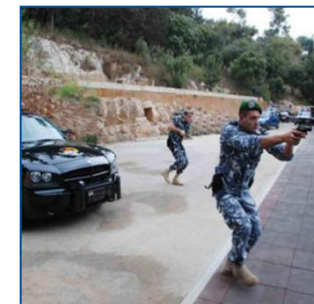




# The MEL/MIL Conceptual Models Based on Flow Charts (6)



## MEL/MIL 2 Special Forces raids Training/Support to Local Forces COA





# The SIMCJOH HLA Classes Objects and Interactions

- In compliance with the standard IEEE 1516 HLA, the SIMCJOH architecture requires the definition of the Federation Object Model (FOM) and the Simulation Object Models (SOM)
- The FOM specifies all the information that are exchanged between the federates during the simulation. The FOM includes the object classes, the attributes, the interactions and the parameters and any other information relevant to the federation. The SOM specifies all the information that each single federate may provide to the federation and all the information that each single federate may receive from other federates through the Run Time Infrastructure
- Within the SIMCJOH federation, exchanged data are grouped in terms of attributes when the data are persistent, in terms of parameters when data persistence is not required





# SIMCJOH HLA Classes Objects and Interactions

## SIMCJOH Federation Object Model

Class	Definition
Asset	Every asset on which sensors or weapons are mounted in the scenario e.g. aircraft, drone, ground unit, demonstration...

Attribute Definition table

Class	Attribute	Definition
Asset	Position	Latitude, [degrees decimal], Longitude, [degrees decimal], Height/Depth [m]
	Angles	Course, Pitch, Roll [radians]
	Speed	Speed [m/s]
	ID	Code to uniquely identify the platform: e.g. AW129_71_xxxx



**SIMCJOH Federation uses Asset as Object including EntityName, Entitytype, Position (Latitude, Longitude, Altitude) . SIMCJOH Federation operates HLA 1516 regular and Evolved; testing was completed using 4.2 Mak RTI using IEEE1516 regular, even if some federate (i.e. SIMCJOH VIS was tested also using Pitch RTI and Portico RTI, SIMCJOH VIS and VIC operates both also with RTI Mak HLA evolved)**



# SIMCJOH HLA Interactions

## SIMCJOH Attribute Table

### Interaction Class Definition Table

Interaction	Definition
Player_Message	Message exchanged among SIMCJOH Federates

### Parameter Definition table

Class	Attribute	Definition
PlayerMessage	Time	when the report has to be sent (if the time is not specified the report as to be delivered ASAP)
	Source	the Player from which the report has been sent (Player ID)
	Content	the Content: the content of the message (String)





# SIMCJOH Messages in HLA



In SIMCJOH Demonstration it was adopted RPR FOM for testing flexibility even with legacy systems; indeed if this FOM represents a format used to support legacy and old simulators based on DIS. The RPR FOM was extended to include EntityName and Latitude, Longitude and Altitude as well as to add Player Message Interaction

SIMCJOH FOM			RPR FOM v2.0 d17			Comments M2D to RPR2 proposal (Aug 20, 2014)
Object Class	Attribute	Definition	Object Class	Attribute		
Asset	Position	Latitude, [degrees decimal], Longitude, [degrees decimal], Height/Depth [m]	BaseEntity.PhysicalEntry	Spatial		
	Angles	Course, Pitch, Roll [radians]		Spatial		Ok
	Speed	Speed [m/s]		Spatial		Ok
	ID	Code to uniquely identify the platform: e.g. AW129_7L_kxxx		EntityIdentifier		Ok
	Name	Name of the asset: e.g. "Harpo"		Marking		Ok
	Type	Type of platform: e.g. Rotary Wing, AUV, Mech, Platoon...		EntityType	Kind+ Domain+ Category	Agreed; since Marking has to be unique as well, we could use Marking as ID as well.
	Class	Class of the Asset: e.g. "Mangusta", "Predator", ...		EntityType	Subcategory+SpecificationExtra	Ok
	Flag	Nation: e.g. e.Italy, France		EntityType	Country code	Ok
	Status	Operative conditions: e.g. damaged, remaining force, power consumption		DamageState	no remaining force or power consumption, only 4 damage levels	
	ROP	Operational Status: e.g. patrolling, moving, attacking, hiding		Not Available	Can be added as SIMCJOH extension to PhysicalEntry objects	Agreed
	Mode	Mode of Conducting the Operation: e.g. moving spread over an area		Not Available	Can be added as SIMCJOH extension to PhysicalEntry objects	
	Other	Subset of Assets able to communicate and fuse data with this asset: e.g. allied forces		Not Available	It can be added as SIMCJOH extension to PhysicalEntry objects	
			BaseEntity.AggregateEntity	Not Available		It will be necessary to extend PhysicalEntry
It will added PlayerMessage to an RPR 2 FOM as new interaction.						
Interaction Class	Parameter	Definition	Interaction Class	Parameter		
PlayerMessage	Time	when the report has to be sent (if the time is not specified the report as to be delivered ASAP)	Comment	VariableDatumSet	as first parameter	
	Source	the Player from which the report has been sent (Player ID)		OriginatingEntity		No
	Content	the Content: the content of the message		VariableDatumSet	Other parameters	

For SIMCJOH Demonstration the SIMCJOH partners decided to use and existing FOMs (e.g. the RPR-FOM version 2.0 draft 17). Indeed the following table reports a possible comparison between the SIMCJOH FOM and the RPR-FOM version 2, draft 17 and shows how it is easy to move from the SIMCJOH FOM to other existing FOMs. The final decision has been taken during the implementation with the aim of having a good tradeoff between a FOM able to assure the correct interoperability between the federates and SIMCJOH functionalities (according to SIMCJOH objectives) and an easier integration with other existing federations. It has been added PlayerMessage to RPR 2 FOM as new interaction as well as some attributes to the Base Entities including position (in Latitude Longitude and Altitude) and Entity Name

*Comparison between the Original Version of SIMCJOH FOM and the RPR-FOM version 2.0*





# SIMCJOH HLA and Message Formats

## SIMCJOH messages description

*SIMCJOH allows to use different formats to exchange data on events, reports and orders*



### PlayerMessage SIMCJOH format



ID	Message Description	Parameters	PlayerMessage Format	COA
1	Request Unit to Move to move to point B	[order id][unit_id][time][B]	# [order id]* Move, [unit_id], [time], [B] \$	1 and 2 CIMIC/KINETIC/LOCAL FORCE and Deterrence/Mixed/Training
2	Assign an escort enforcement to Negotiator	[order id][unit_id][time][Negotiator]	# [order id]* Escort, [unit_id], [time], [Negotiator] \$	1 and 2 CIMIC/KINETIC/LOCAL FORCE and Deterrence/Mixed/Training



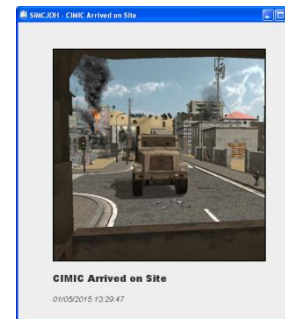
### PlayerMessage in JSON (JavaScript Object Notation) Format.

*Both format could be activated concurrently generating in HLA multiple messages for same event*



Message content in JSON format:

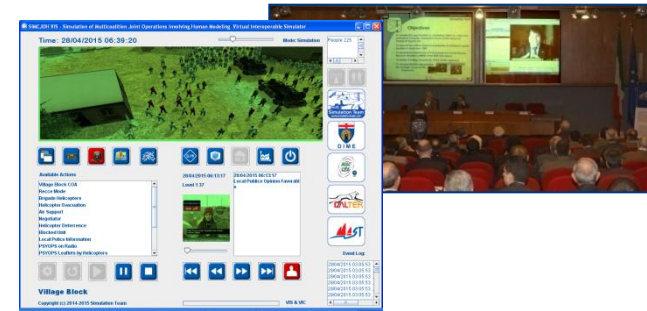
```
{
  "id": "string", "_id": "unique message id",
  "type": "string, defines the message type, can be one of order|report|request",
  "sender": "string, unit who sent the order or report; should be unique in the federation",
  "what": "string, the actual order (e.g. Move) or request (e.g. TBD) or report (e.g. status report)",
  "taskee": "string, unit to execute an order; must be unique in the federation",
  "when": "string, format = YYYYMMDDHHMMSS.SSS, UTC, when to execute an order or when an observation took place; empty string or parameter not provided means ' asap',
  "location": "{ \"lat\": float, \"lon\": float, \"alt\": float }", "_location": "can be: destination to move to or location target to fire at, etc; 'alt' would be optional",
  "waypoints": [{"lat": float, \"lon\": float, \"alt\": float }, {...}], "_waypoints": "array of locations",
  "whom": "string, e.g. unit to be transported, evacuated or escorted",
  "report": "string, the actual report message; could be json-like as well",
  "consumable": "string, defines the consumable to be considered, e.g. fuel or food",
  "quantity": "integer, \"_quantity\": \"amount of consumable, liter (fuel) or 'packages' (food)",
  "duration": "integer, \"_duration\": \"duration, e.g. of loading goods, in minutes",
  "mode": "string, one of hidden, regular, explicit OR reserve, patrolling, standby",
  "comment": "string, any comment, e.g. 'why' for an order"
}
```





# Conclusions

- SIMCJOH Project successfully faces new challenging aspects on Interoperable Simulation and Human Behaviors
- SIMCJOH allowed to study and develop new simulation models in order to support decision makers, Commanders and their Staff
- The architecture, the use modes and all the conceptual models have been successfully completed
- SIMCJOH Federates as well as the Federation is Operative and Demonstrated
- The SIMCJOH Demonstrator is an interactive Live Experience available for Commanders





# References



**Agostino G. Bruzzone, Marina Massei**  
**DIME University of Genoa, Italy**  
 Email {agostino, massei}@itim.unige.it  
 URL [www.itim.unige.it](http://www.itim.unige.it)



**Laura Boldi, Agatino Mursia**  
**Marco Picollo, Renato Baglieri**  
 Finmeccanica Land & Naval Defence Electronics Division  
 Email {laura.boldi, agatino.mursia}@selex-es.com  
 URL [www.selex-es.com/it](http://www.selex-es.com/it)



**Francesco Longo**  
**MSC-LES University of Calabria, Italy**  
 Email [f.longo@unical.it](mailto:f.longo@unical.it)  
 URL [www.msc-les.org](http://www.msc-les.org)



**Peter Meyer zu Drewer**  
**CAE GmbH, Germany**  
 Email [Peter.MeyerzuDrewer@cae.de](mailto:Peter.MeyerzuDrewer@cae.de)  
 URL [www.cae.de](http://www.cae.de)



**Letizia Nicoletti**  
**CAL-TEK srl, Italy**  
 Email [l.nicoletti@cal-tek.eu](mailto:l.nicoletti@cal-tek.eu)  
 URL [www.cal-tek.eu](http://www.cal-tek.eu)



**Simonluca Poggi**  
**Christian Bartolucci**  
**MAST srl, Italy**  
 Email [simonluca.poggi@mastsrl.eu](mailto:simonluca.poggi@mastsrl.eu)  
 URL [www.mastsrl.eu](http://www.mastsrl.eu)

