



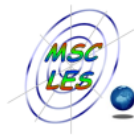
SIMCJOH

*Simulation of Multi Coalition Joint
Operations involving Human Modeling*

EXECUTIVE SUMMARY



DIME
Università
di Genova



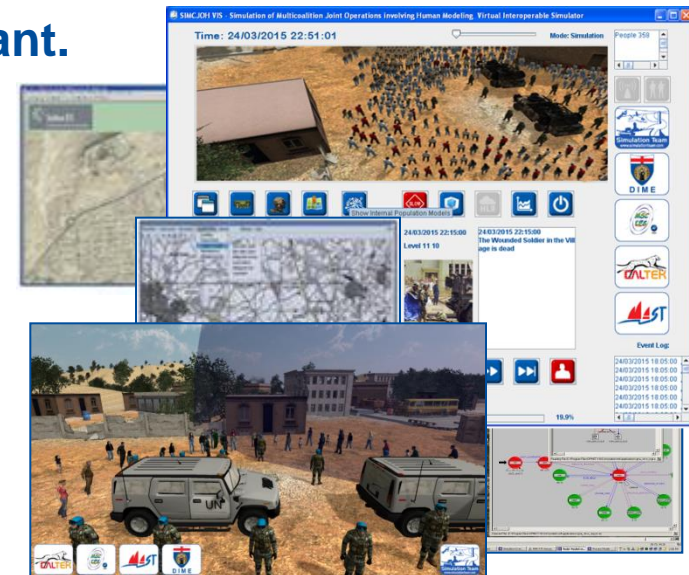


Introduction to SIMCJOH

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

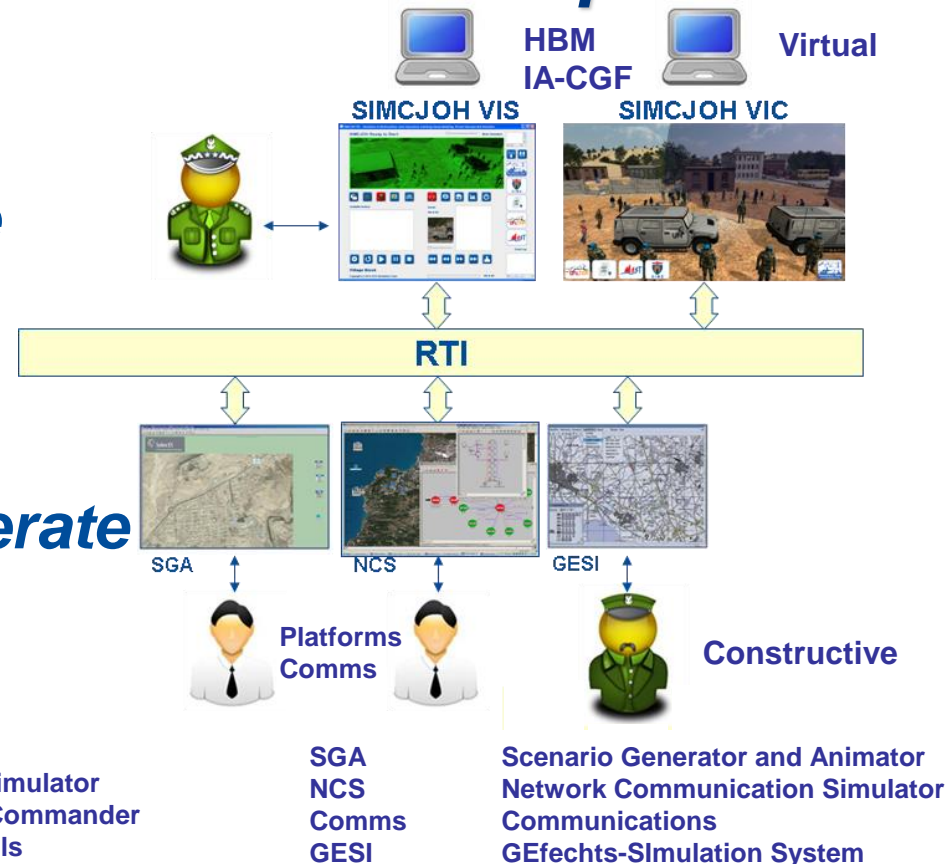




SIMCJOH Overall Architecture

SIMCJOH Architecture Main Components

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





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



IA-CGF
HBM



SIMCJOH VIS



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



IA-CGF
HBM



Commander



SIMCJOH VIS



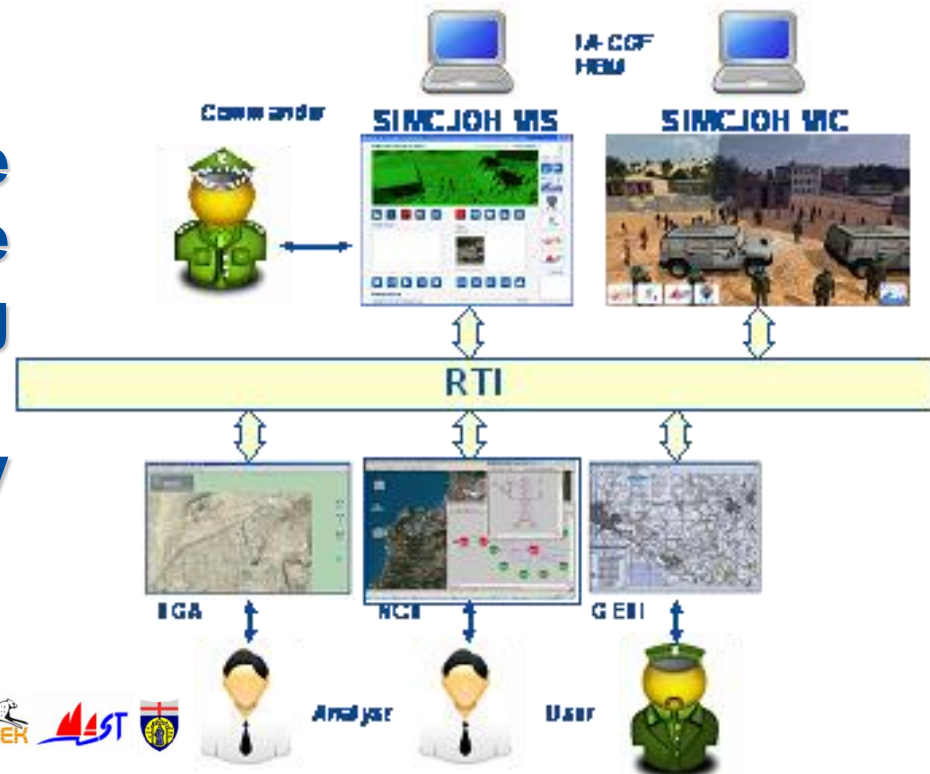


SIMCJOH

Fully Federated Mode

Example of SIMCJOH Architecture: Fully Federated Operational Mode

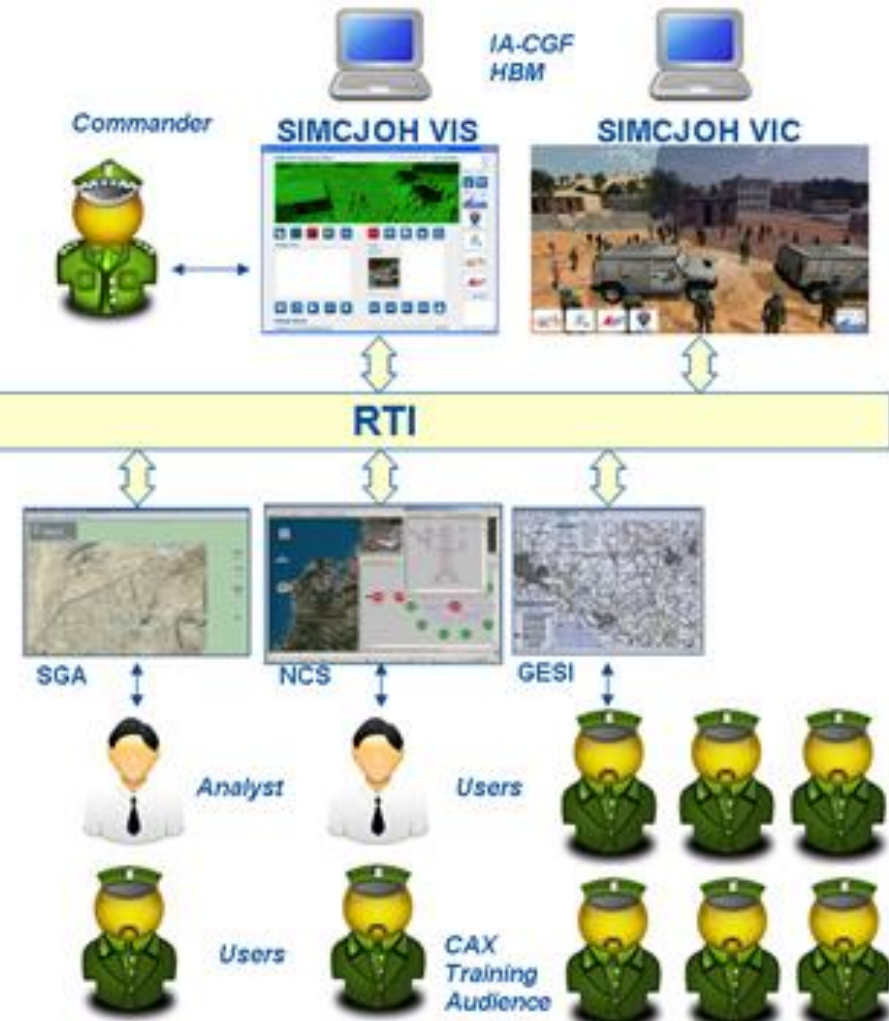
SIMCJOH could use the fully federated mode this provides the possibility to simulate the whole scenario by using both Discrete Event and Virtual Simulation, entity based simulators, platforms simulator





SIMCJOH Architecture for CAX

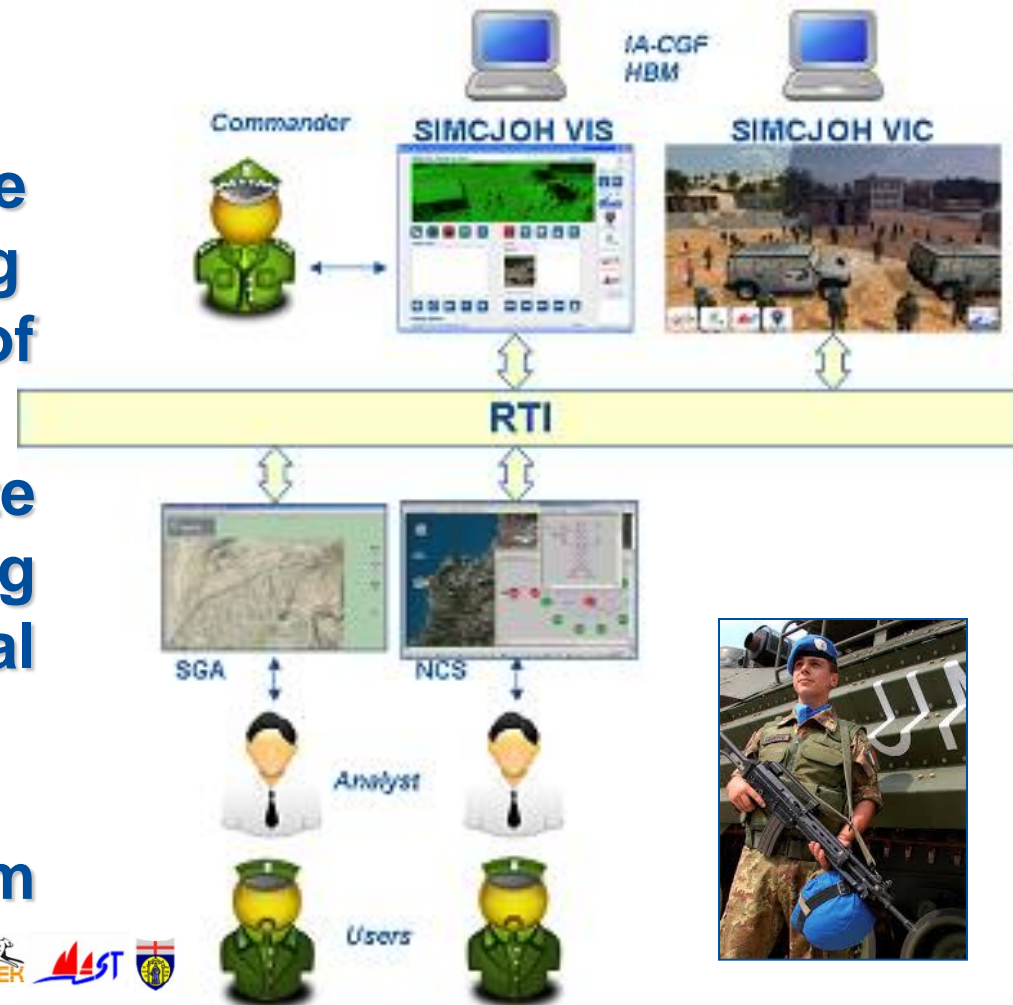
SIMCJOH could be used in federated mode as part of a CAX: people exercising in an entity Simulator (e.g. GESI) interact dynamically with SIMCJOH VIS and VIC managing the complex MEL/MIL and Population Behavior as well as other models (e.g. SGA, NCS).





Partial Federation for SIMCJOH

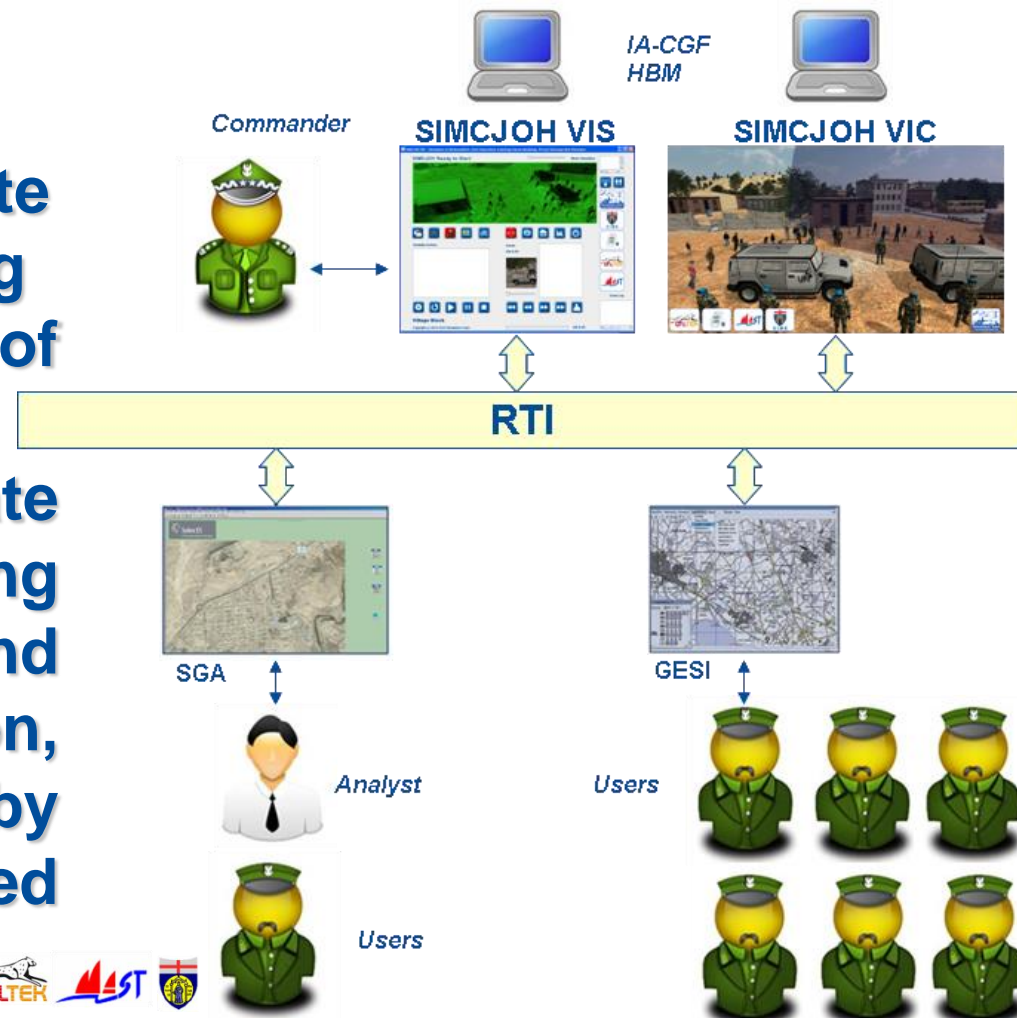
SIMCJOH could operate in federated mode using RTI and just a subset of federated; this provides the possibility to simulate the scenario by using Discrete Event and Virtual Simulation, communication simulation and platform simulation by SGA





Flexible Configuration of SIMCJOH

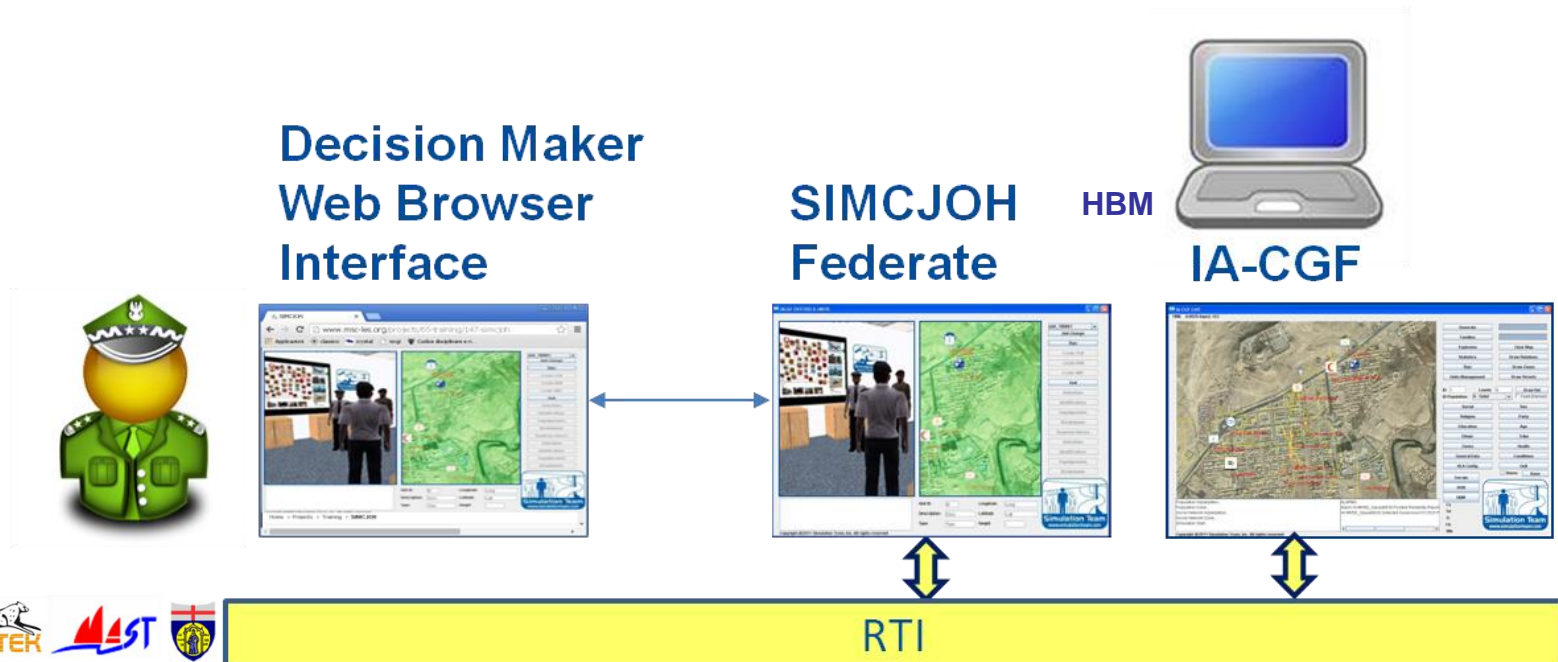
**SIMCJOH could operate
In federated mode using
Different subsets of
federated; in this case
it is possible to simulate
the scenario by using
both Discrete Event and
Virtual simulation,
platform simulation by
SGA and entity based
simulation by GESI**





Alternative Possible Architectures

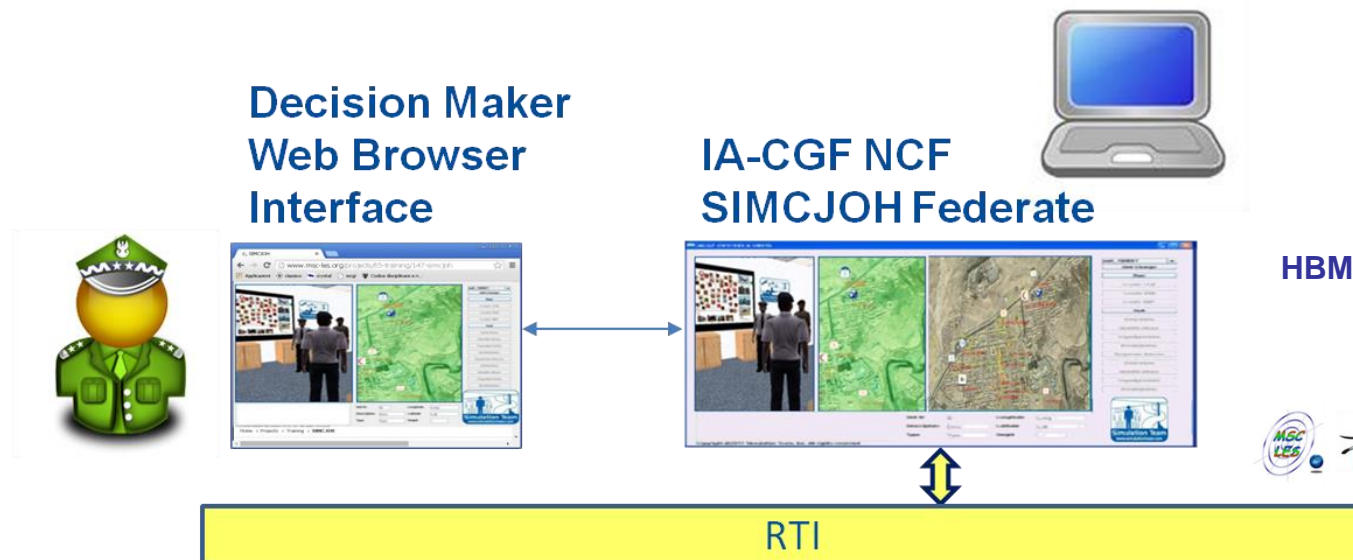
Original Ideas for Graphic User Interface and access to SIMCJOH by Decision Makers was updated to improve user interface capabilities based on User Comments





Alternative Possible Structure for Stand Alone

Original Architecture used for define the role of the IA-CGF encapsulated directly within a NCF together to support SIMCJOH Federation was updated as presented before for guarantee better flexibility by dividing Discrete Event Simulation, IA-CGF and Virtual Simulation and for improving user interface capabilities





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

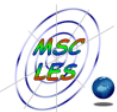
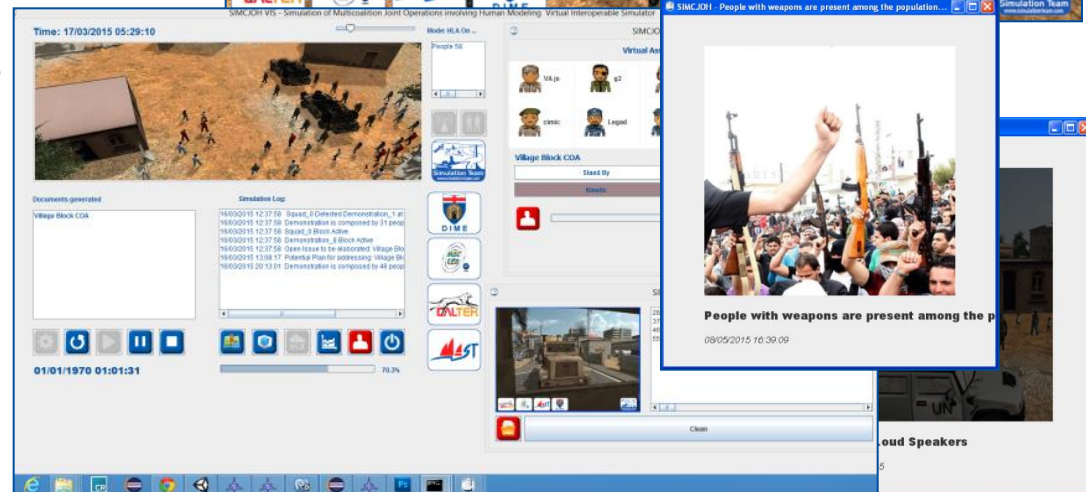
- Virtual Simulation is based on an evolution of the Simulator CTRAIN, that was customized for SIMCJOH and became SIMCJOH_VIS (Virtual Interoperable Commander) Federate is in charge of providing 3D Virtual Environments in which the Commander can feel the sensation to be directly involved in the military 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.



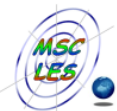
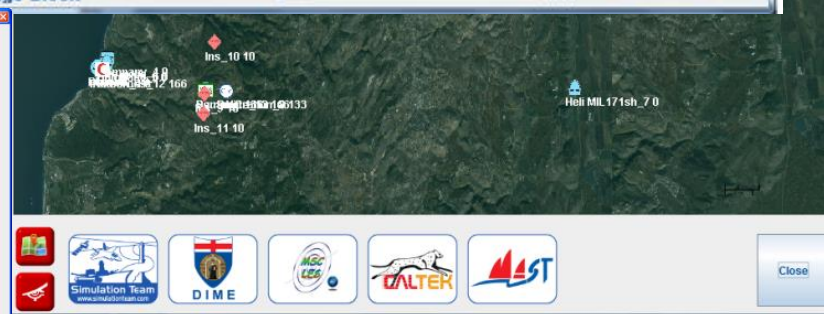
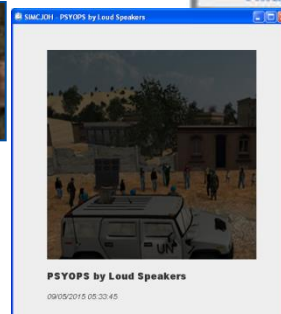
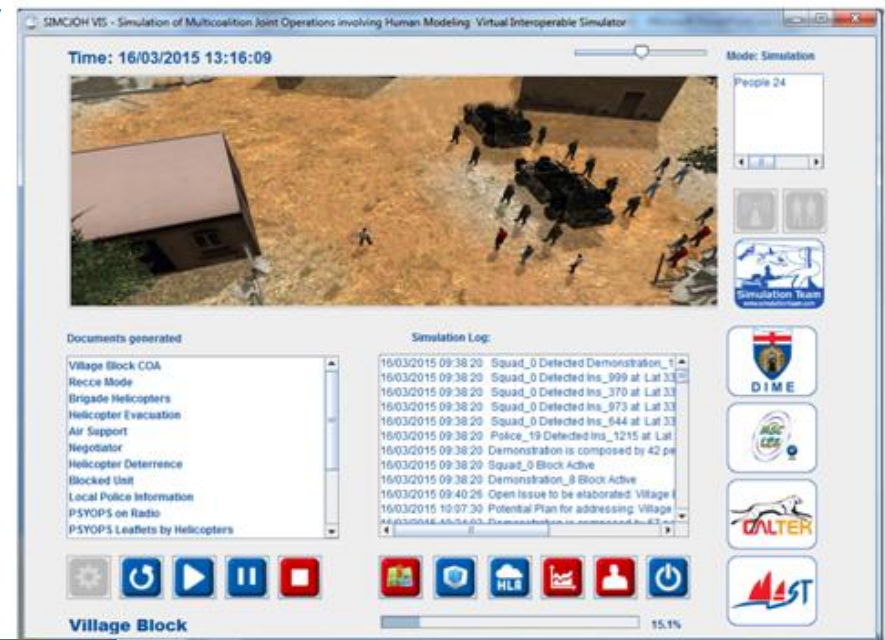


SIMCJOH_VIS

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 can simulate 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



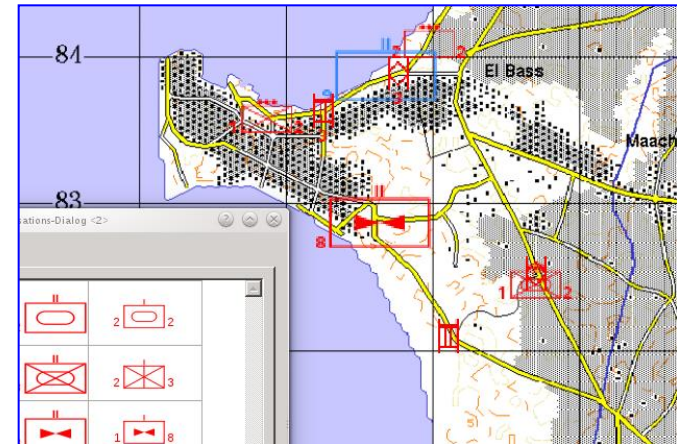
**CRC forces in GESI
interacting with Human**



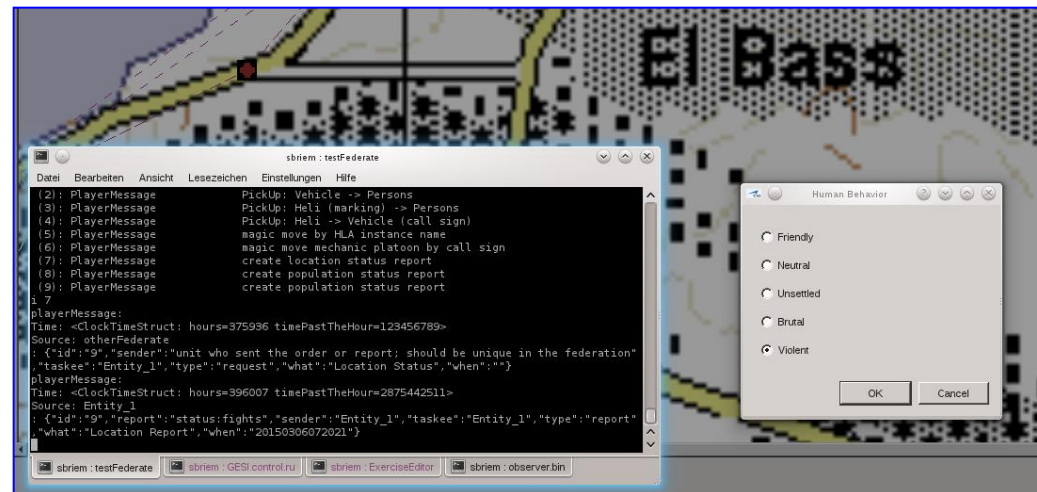
GESI Simulation

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**

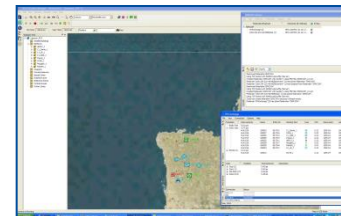




Platforms & Communications

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 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 Headquarters 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



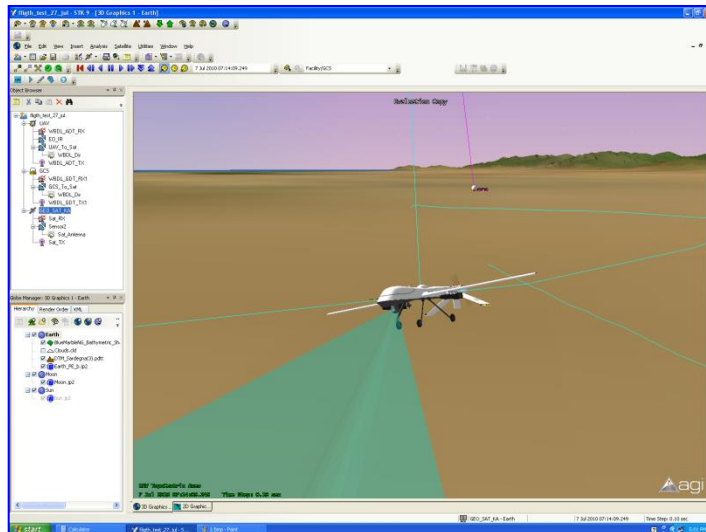
D) Realize (optional module) the “System-in-the-Loop” (SITL) capability that allows for establishing a connection “Live-Constructive” through which the real hardware and the simulation environment interact as a single unified system. This allows for:

- 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, SELEX ES, 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.



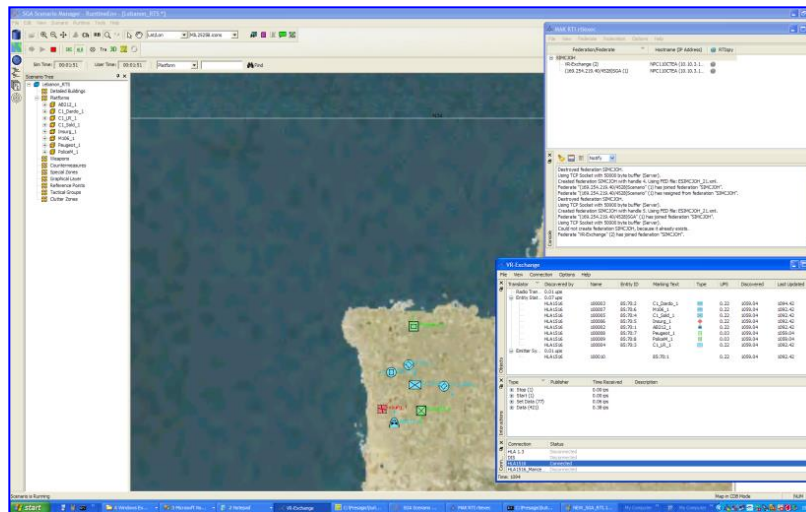
- ✦ **NCS can operate in Synergy** with advanced external Simulation tools like **STK** and MatLab for the best Simulation Fidelity in order to:

- 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)

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.

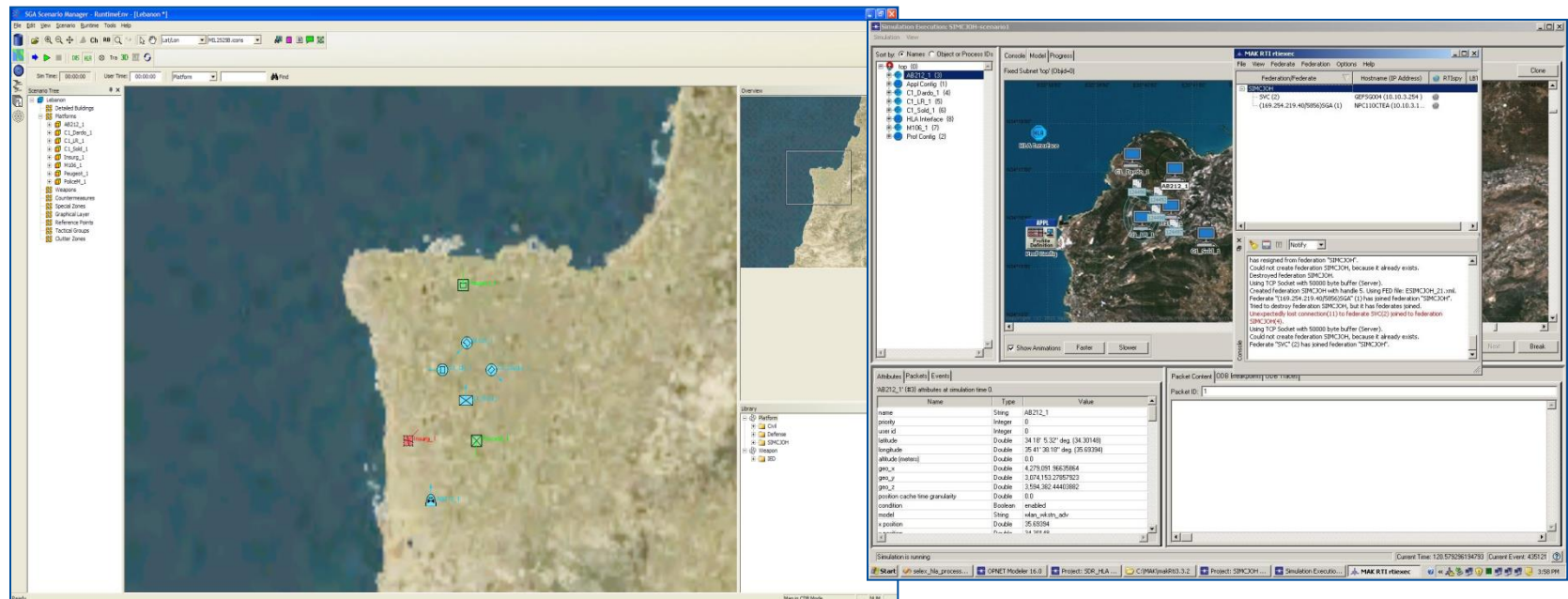




SGA & Platform Simulation

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.

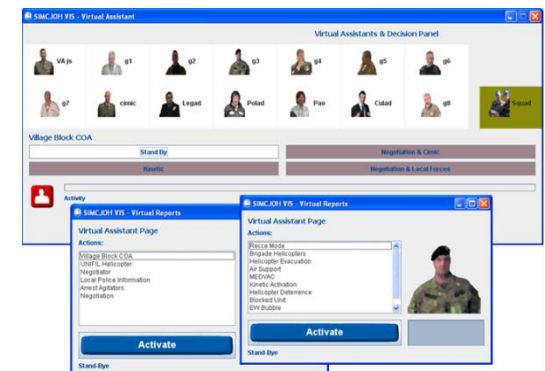




- **Fully Federation Operational Mode**
- **Fully Federation Operational Mode Extended by HLA**
- **Mix Federated Operational Mode**
- **Stand-Alone Operational Mode**



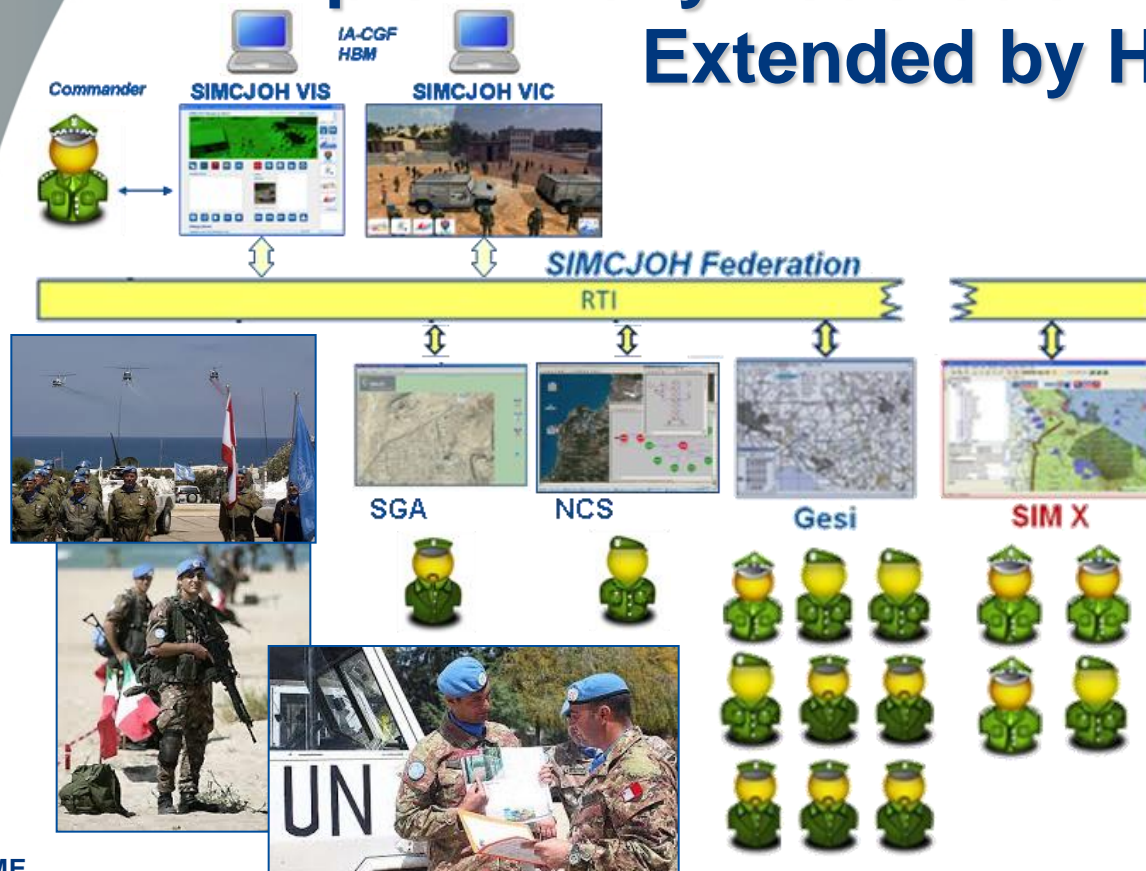
The screenshot shows a software window titled "Virtual Assistant". Inside, there is a grid of 12 small video feeds, each showing a different virtual avatar. The avatars are labeled with identifiers: g1, g2, g3, g4, g5, g6, g7, g8, g9, g10, g11, and g12. To the right of the grid is a section titled "Virtual Assistant's Decision Panel". The interface has a blue header bar and a standard Windows-style title bar.





SIMCJOH Open Architecture

Example of Fully Federation Operational Mode Extended by HLA



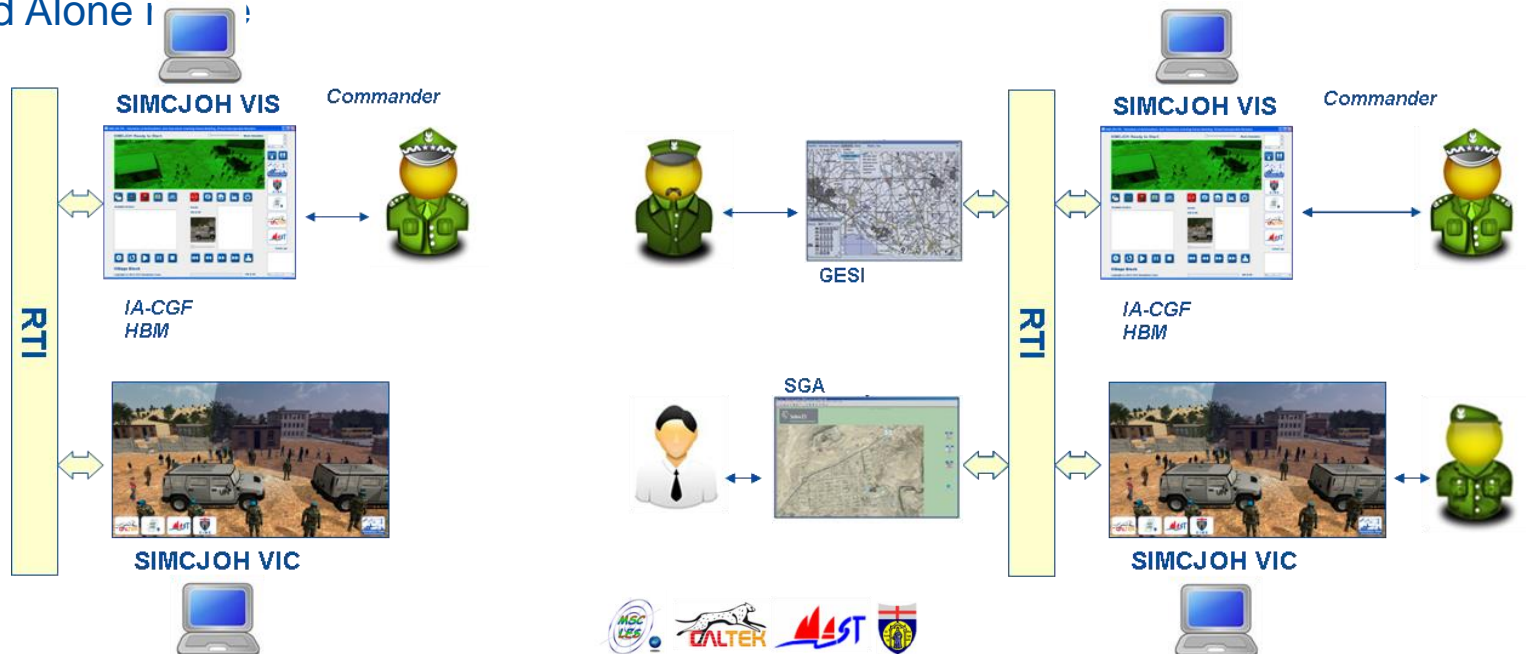
SIMCJOH architecture is based on the HLA standard for distributed simulation. So the SIMCJOH architecture is ready for further development in terms of capability of being integrated with additional federates. This represents a major capability of proposed approach



SIMCJOH Single Multiuser

Example of Mix Federated Operational Mode

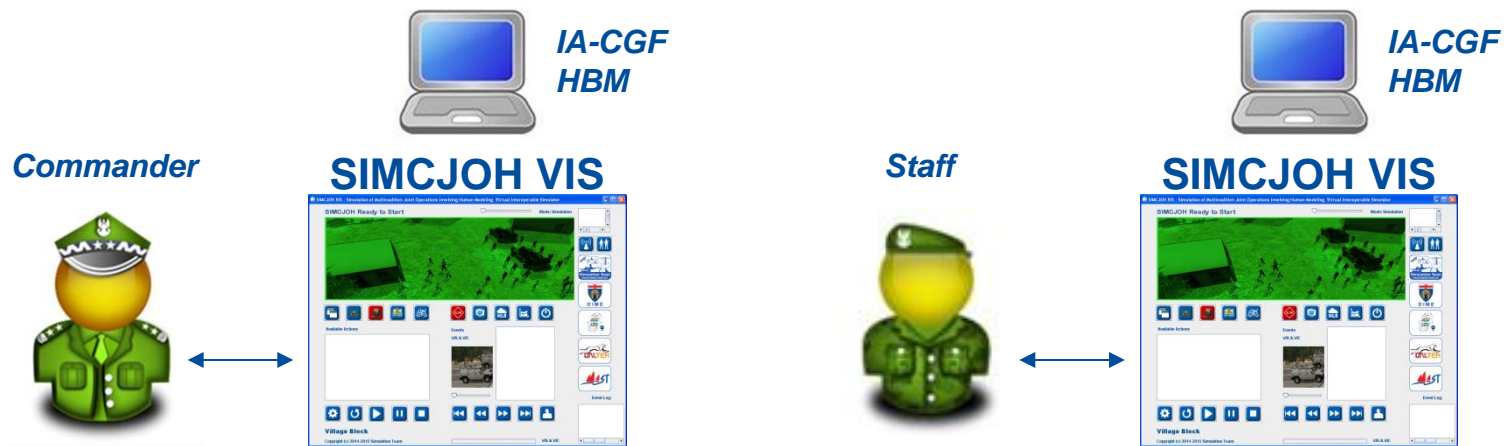
Only some federates are included in the federation; this view is particularly useful to prove the technological capability of SIMCJOH of working as a modular system (with one or more users) that evolves from fully federated and Mix Federated to Stand Alone !





SIMCJOH Stand Alone

Example of Stand-Alone Mode

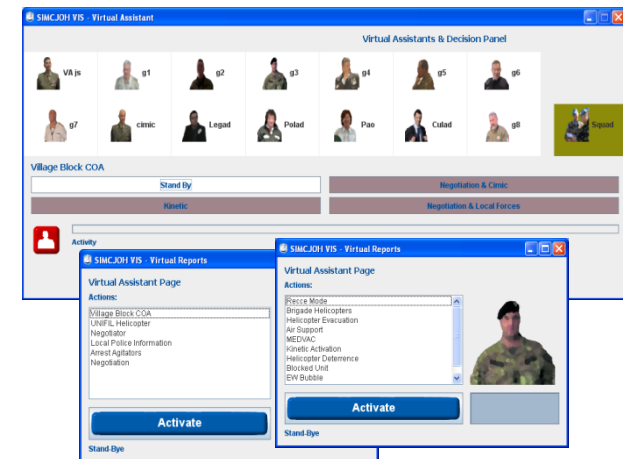


This is the case in which the Commander plays with the SIMCJOH Simulation Model in a standalone way that guarantees a quick and simple use. This approach is devoted to involve the Commander, and his staff, in a self-assessment mode over new mission environments and in scenario familiarization respect 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

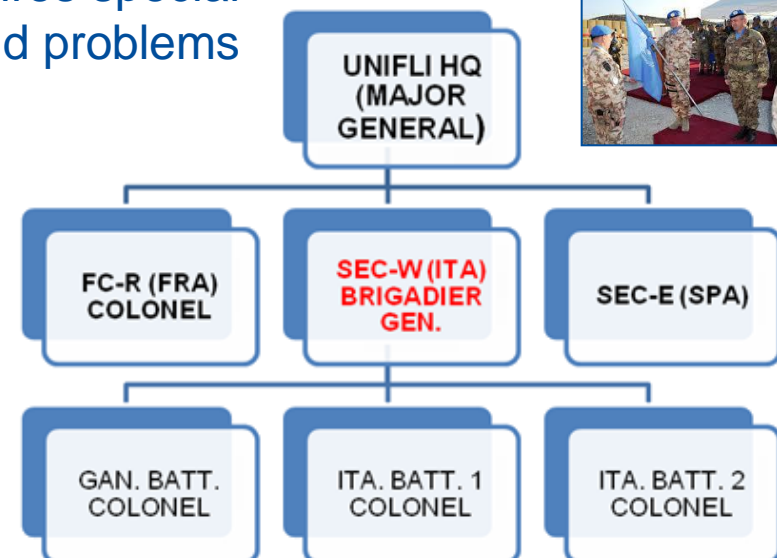
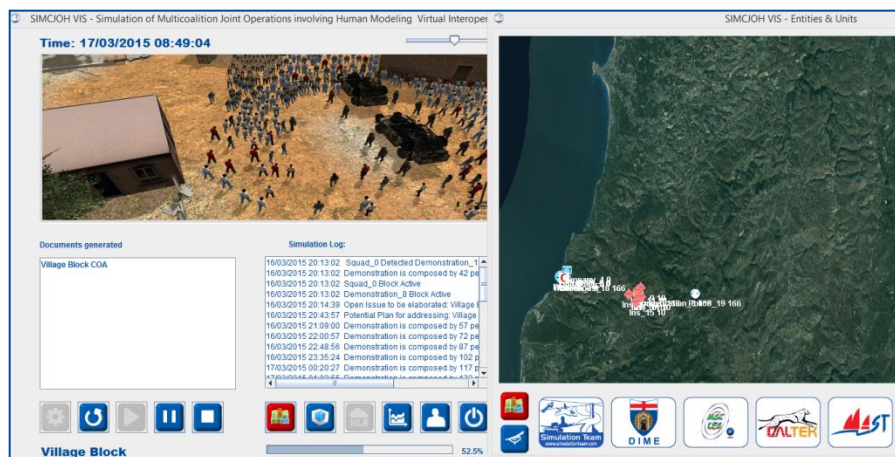
These levels could be applied to SIMCJOH MEL/MIL and therefore they make up the game levels that the user is required to deal with.





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

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 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 inhabitants. The village is characterized by a No presence of Hostile Forces. The 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 Good opportunity for snipers. The distance toward video-photographic the national radio network. Currently No Coverage by Media Yet. Local opinion Mostly Favorable Percentage. The presence of genetic demonstrating in the area.

COA1: Negotiation & CIMIC

1) Negotiation & CIMIC

Introduction of a CIMIC operator to direct Face to Face (F2F) negotiation. 2 Teams for protecting the CIMIC operator. Availability of food kits to be distributed on site (100 food kits). Local Police and Forces have not been contacted. Two helicopters are available for surveillance operations. Preparation of official press support (in counterpropaganda (cnp) app).

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

g8

Squad

cimic

Legad

Polad

Pao

Culad

Village Block COA

Stand By

Kinetic

Negotiation & Cimic

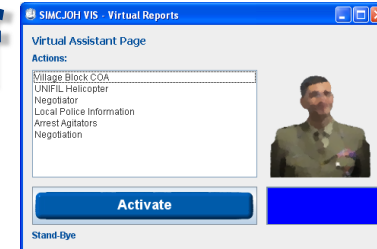
Negotiation & Local Forces

Activity

Stand-by



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.

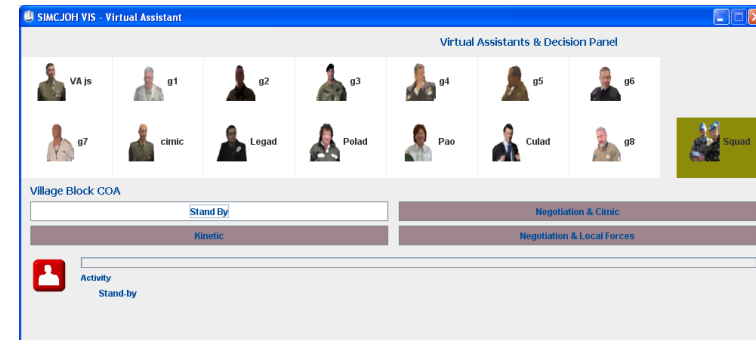
After the COA selection, the discrete event simulation is run and therefore the selected MEL/MIL stochastically evolves according to the COA selected. The SIMCJOH discrete event simulation is able to carry out multiple fast-time replications of the same simulation run and it is able to evaluate Military 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

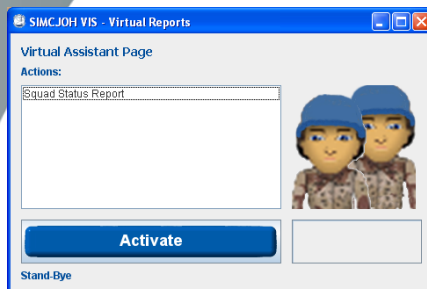
COA: Course of Action

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.



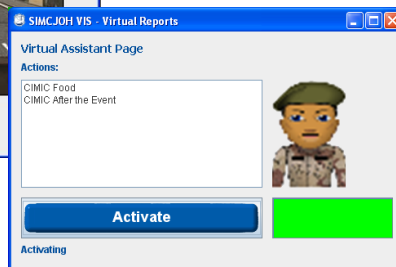
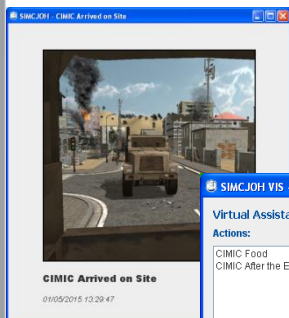
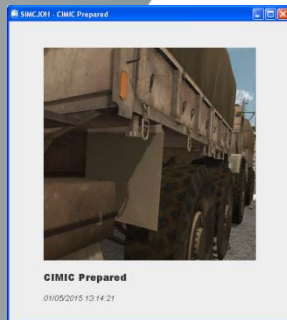


MEL/MIL1 Village Block

COA: CIMIC & Negotiation COA



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



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

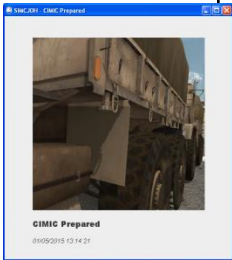


MEL/MIL1 Village Block

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"> - Availability of food kits to be distributed on-site (100 food kits) - Local Policies and Forces have not been contacted - Two helicopters are available for surveillance operations - Preparation of an official press to support the counterpropaganda (info-ops) 	<ul style="list-style-type: none"> - Concentration of military forces in the village area / reduction of military forces in surrounding areas - The presence of the 2 Squads supporting the CIMIC operator will saturate (in terms of military presence) the area of the event 	<ul style="list-style-type: none"> - General increase of social tension - 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) - The massive presence of armed soldiers could induce the local male population to arm themselves - Any flash news broadcasted on the national radio network could negatively affect the population of the village 	<ul style="list-style-type: none"> - Possible reduction of movement capabilities (e.g. the vehicle for food kit transportation is blocked) - Possible exploitation of hostile forces in other areas due to the reduced military presence - Possible loss of credibility at the local level - Negative Media effects 	 <p>CIMIC Prepared 01/03/2015 13:14:21</p>



MEL/MIL1 Village Block

COA: Kinetic COA



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

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



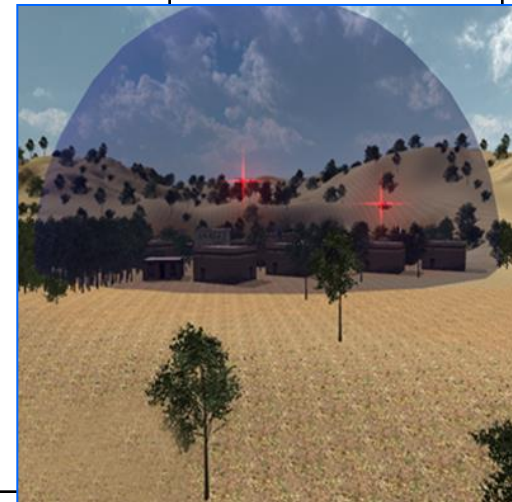
MEL/MIL1 Village Block

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





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



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



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



COAs for MEL/MIL2: Mixed COA





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

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



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



COAs for MEL/MIL2: Training & Support to Locals

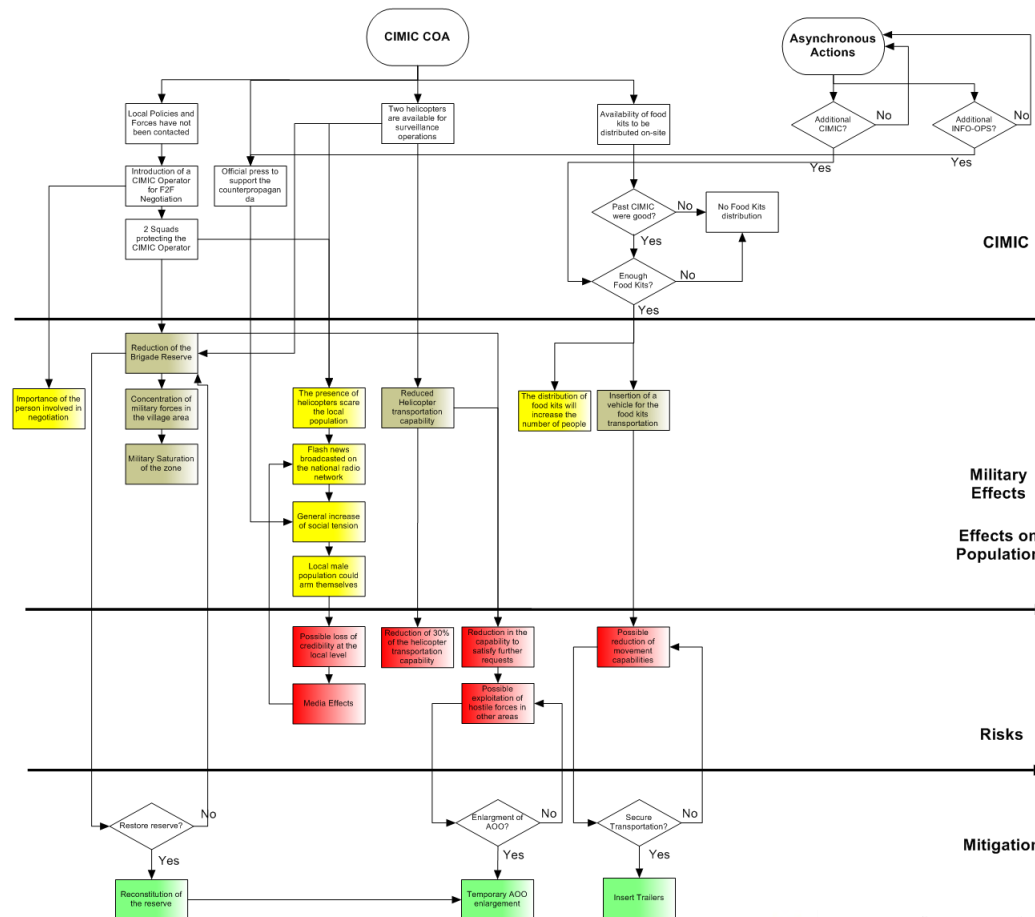
MEL/MIL 2: Special Forces raids Training/Support to Local Forces COA 1/1



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



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

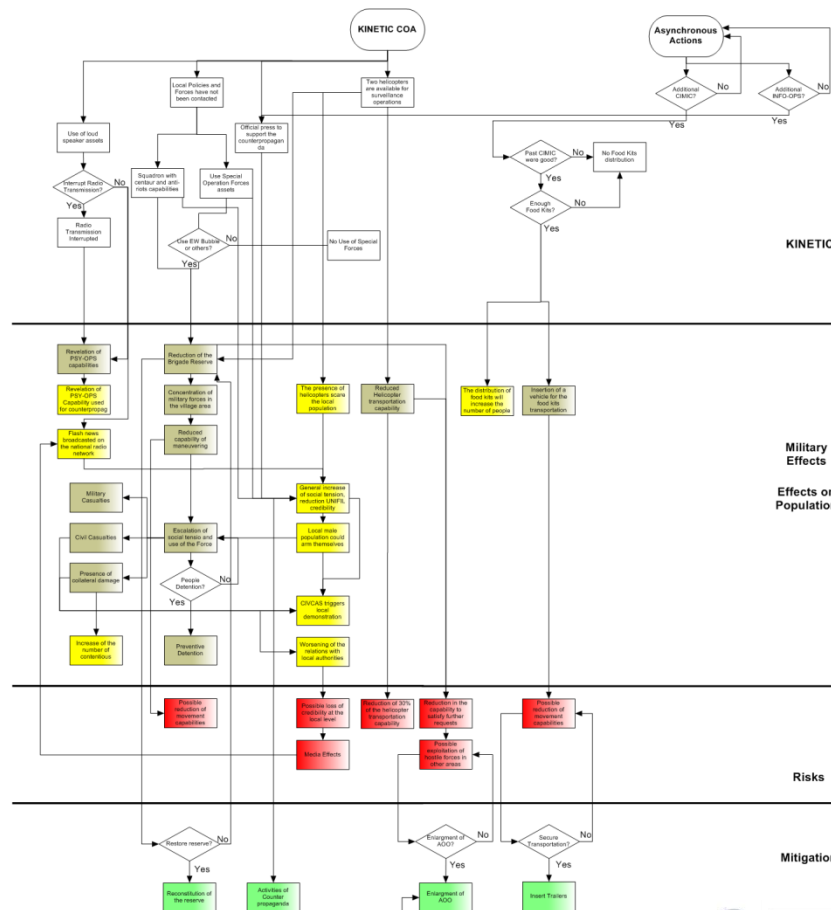


MEL/MIL1 Village Block: CIMIC COA

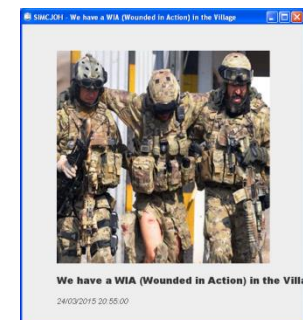




The MEL/MIL Conceptual Models Based on Flow Charts (2)

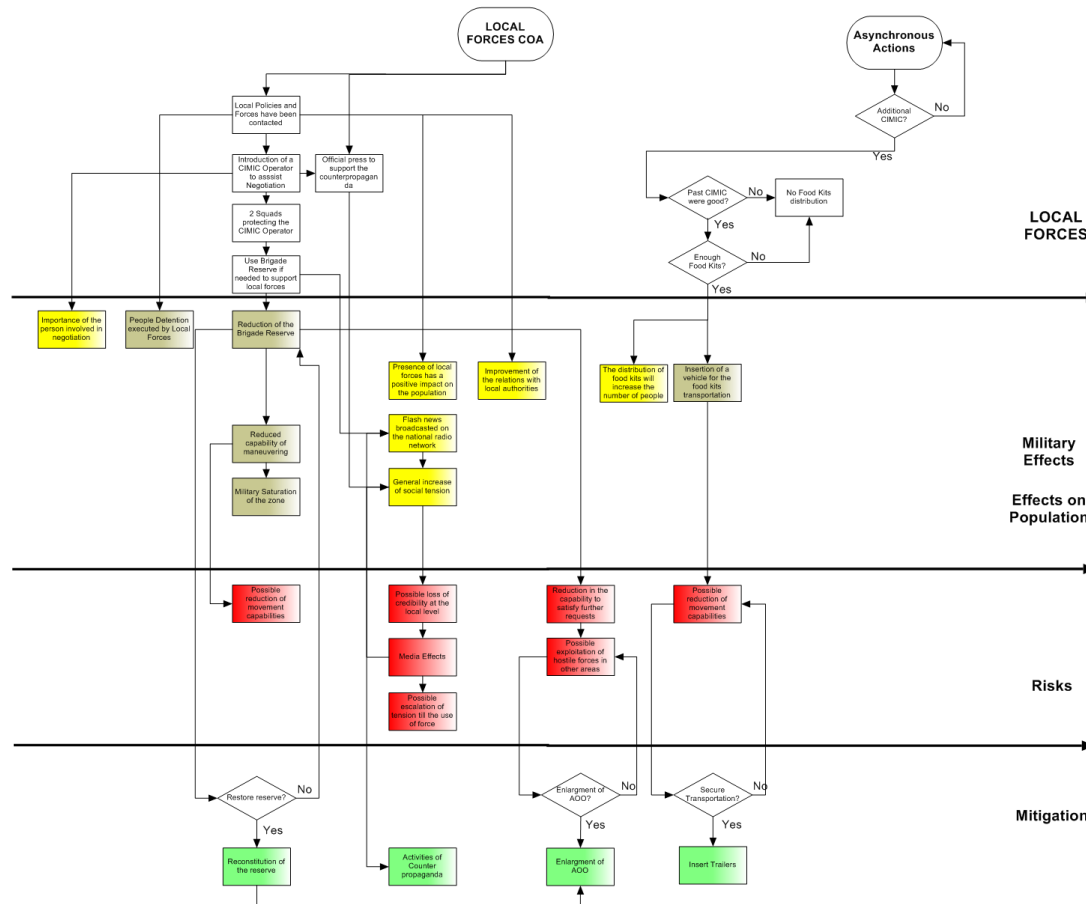


MEL/MIL1 Village Block: KINETIC COA





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

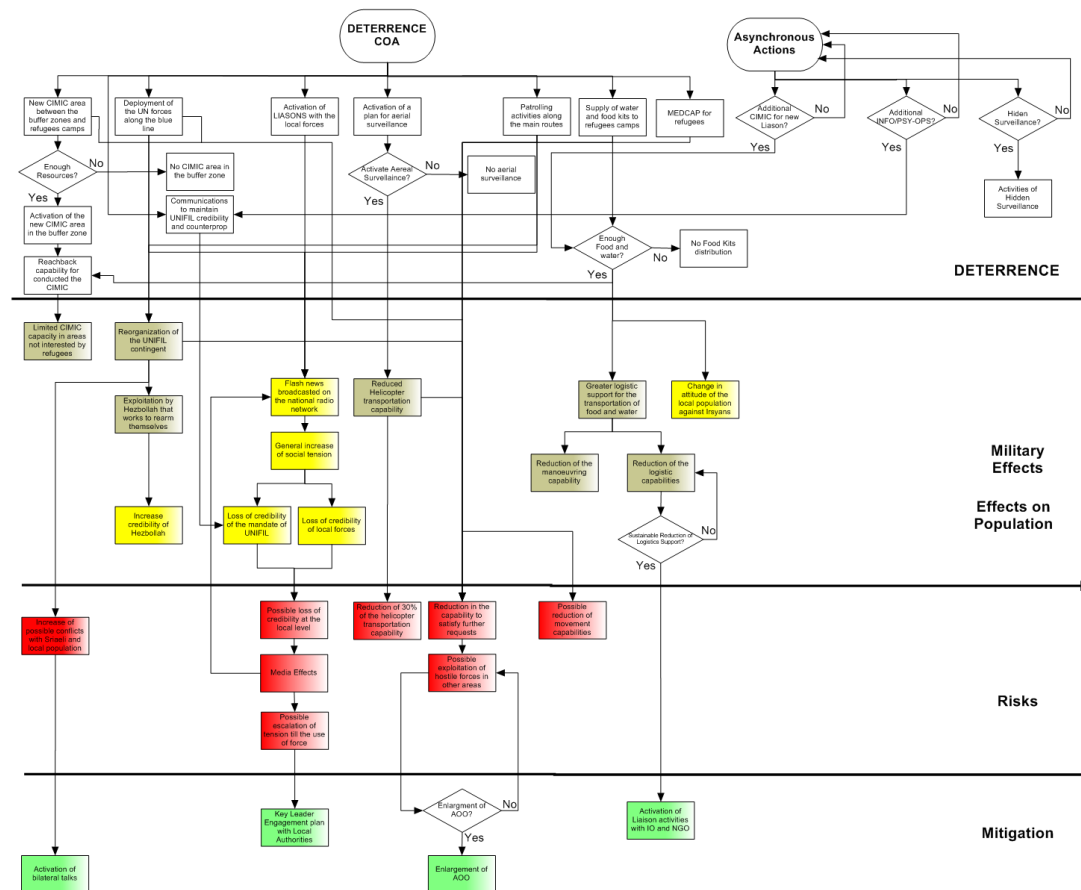


**MEL/MIL1
Village Block:
LOCAL
FORCES
COA**





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

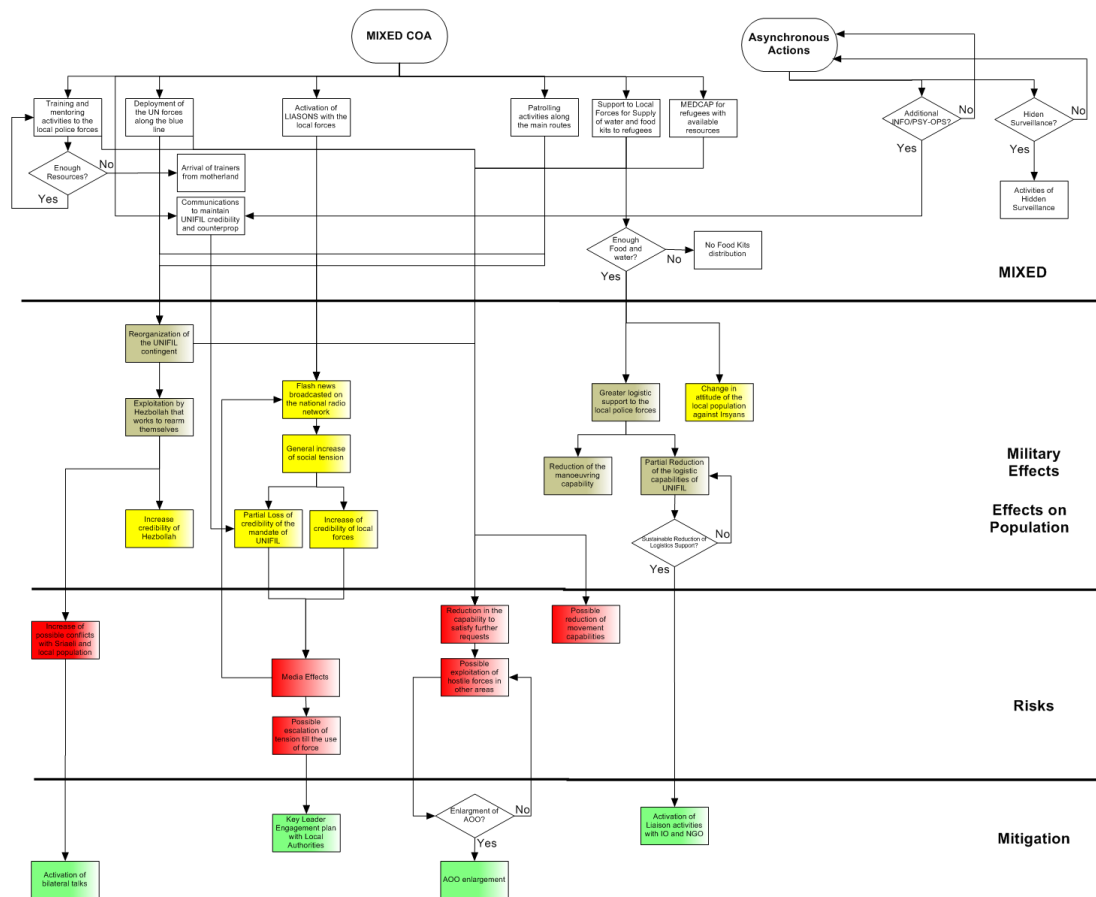


MEL/MIL 2
Special Forces
raids
DETERRENCE
COA





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

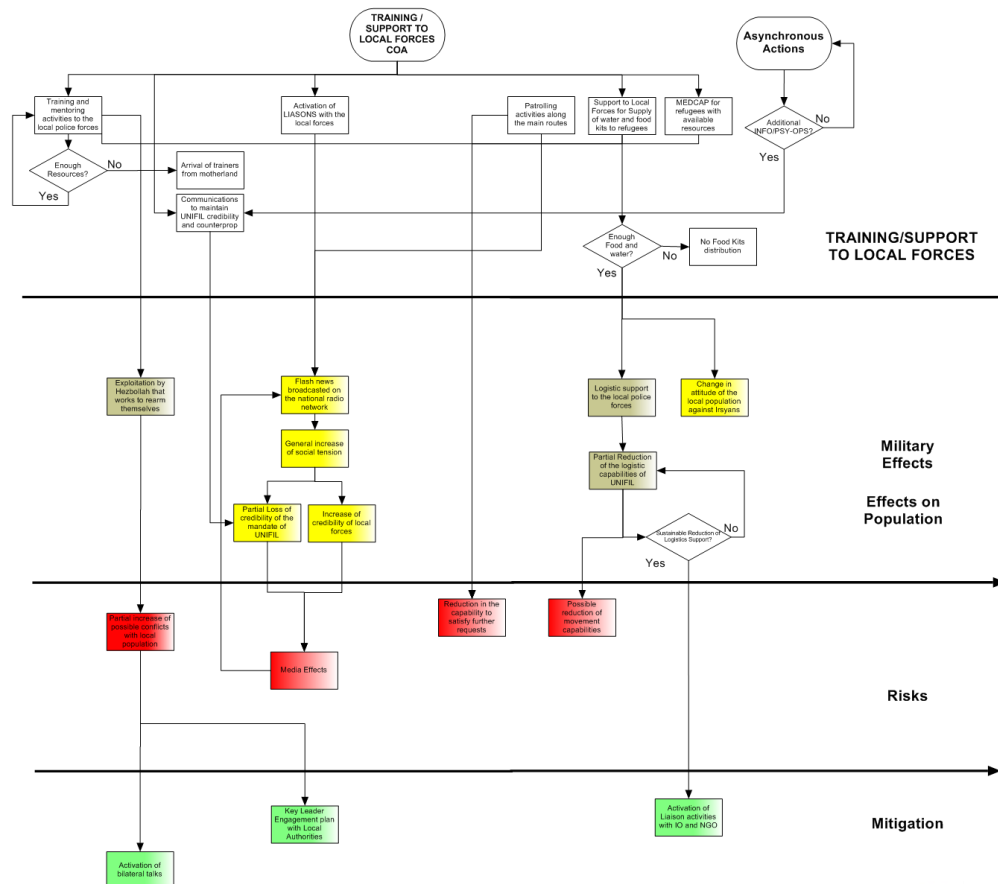


MEL/MIL 2
Special Forces
raids
MIXED COA





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		
Object Class	Attribute	Definition	Object Class	Attribute	Comments M2D to RPR2 proposal (Aug 20, 2014)
Asset	Position	Latitude, [degrees decimal], Longitude, [degrees decimal], Height/Depth [m]	BaseEntity.PhysicalEntity	Spatial	
	Angles	Course, Pitch, Roll [radians]		Spatial	Ok
	Speed	Speed [m/s]		Spatial	Ok
		Code to uniquely identify the platform: e.g. AW129_71_Kxxx			
	ID	Name of the asset: e.g. "Harpo"		EntityIdentifier	Ok
	Name			Marking	Ok
	Type	Type of platform: e.g. Rotary Wing, AUV, Mech, Platoon...		EntityType	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",		Subcategory+Specification	Ok
	Flag	Nation: e.g. Italy, France		Country code	Ok
	Status	Operative condition: e.g. damaged, remaining force, power consumption		DamageState	no remaining force or power consumption, only 4 damage levels
	FOR	Operational Status: e.g. patrolling, moving, attacking, hiding		Not Available	Can be added as SIMCJOH extension to PhysicalEntity Objects Agreed
	Mode	Mode of Conducting the Operation: e.g. moving spread over an area		Not Available	Can be added as SIMCJOH extension to PhysicalEntity 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 PhysicalEntity Objects
			BaseEntity.AggregateEntity	Not Available	It will be necessary to extend PhysicalEntity
It will add 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 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

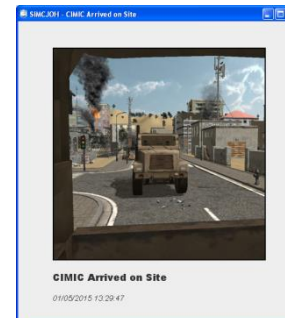


PlayerMessage in JSON (JavaScript Object Notation) Format.



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
}
```

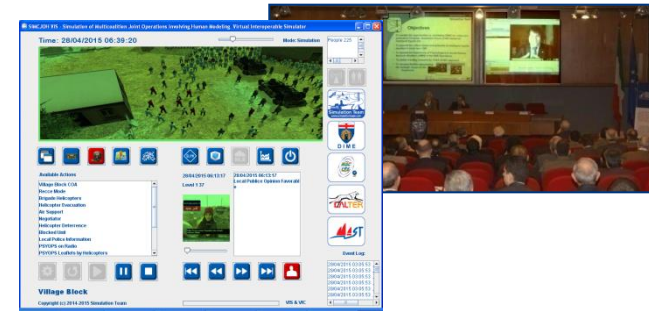


Both format could be activated concurrently generating in HLA multiple messages for same event



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



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