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Command and Operations Centers in Virtual Worlds

NAVAL POSTGRADUATE SCHOOL – MOVES INSTITUTE

EADS INNOVATION WORKS

Virtual Operations Centers

Defense and Emergency Response

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Universities, Research Partners and Related Technologies

Core Technologies: Overview

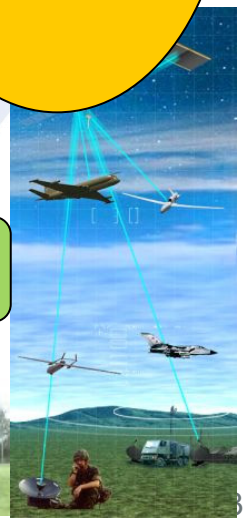
TANGO

Immersive | **Intelligent**

- **Tele Immersion**
- **Visual Analytics**
- **Virtual Operation Centre (VOC)**
- **Natural Speech Recognition**
- **Semantic Reasoning**
- **AI Planner Issue-Solver**
- **Agent Based Simulation**

Fully Auditable Recording for Mission Reversal

Situational Awareness



Core Technologies: Immersive

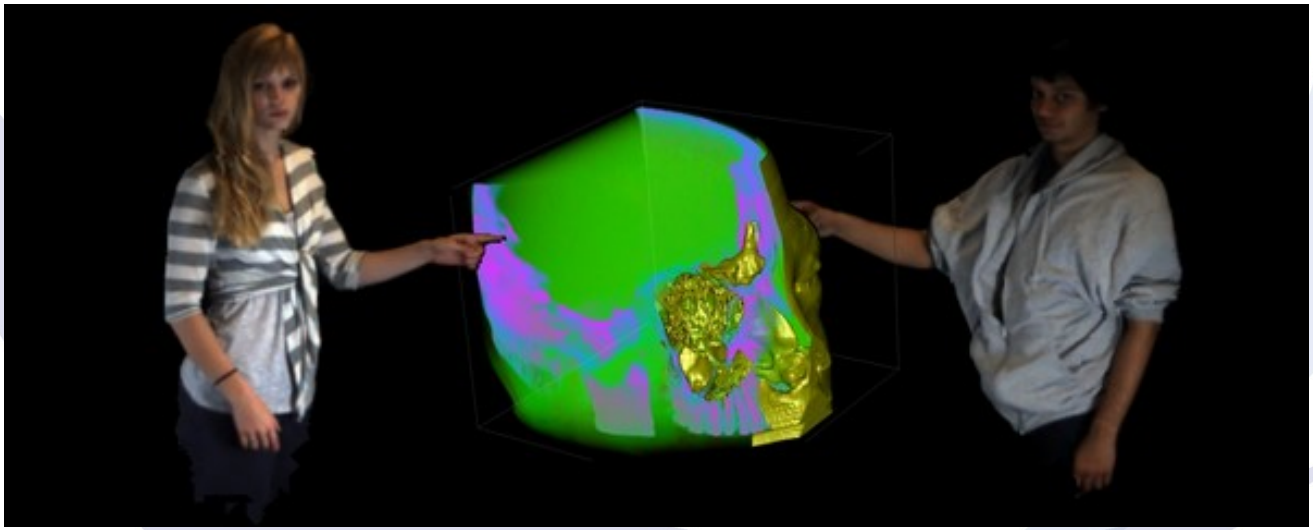
Communication and human interaction is crucial in C2 and Emergency Response operations.

Emergency Response operations in particular, require quick and immediate collaboration and interaction between individuals that are often remotely located.

In order to guarantee the same efficiency and effectiveness characteristics of live face to face interaction, TANGO is researching and developing a rich and immersive environment able to offer an enhanced experience very similar to the natural live human collaboration.

Core Technologies: Immersive (Tele Immersion)

Tele-immersion is aimed to enable users in geographically distributed sites to collaborate in real time in a shared simulated environment as if they were in the same physical room.



Core Technologies: Immersive (Virtual Operation Centre)

An "intelligent" or "knowledgeable" Virtual Operation Centre to act as a knowledge aid to support collaborative tasks and mission planning, able to provide a knowledge assistant in any location a user wishes via whatever presentation methods are appropriate.

Core Technologies: Immersive (Visual Analytics)

Multiple heterogeneous data inputs can be read and analysed to provide decision makers with a visual ‘state of play’ dashboard.

Users can monitor performance indicators in real-time visually (2D/3D) and interrogate the representation of the data to the desired level of granularity.

This will aid decision makers to quickly identify the ‘state of the world’, in order to make informed decisions based upon masses of available information in an easily recognisable format.

Core Technologies: Immersive
(Natural Speech Recognition)

A state of the art automatic speech recognition engine is included in the kernel of the TANGO architecture, which handles untrained and natural conversational speech with multiple users talking simultaneously.

Being able to understand and interpret the collaboration and the decision making process live during the Emergency Response operation opens new frontiers in the development of decision making support tools.

The system is now able to identify the different individuals, rules and operation. Consequently it can provide appropriate and opportune information, plans, issues, solutions and contacts that the responder can use efficiently during the crisis management.

It can also generate a textual transcription of speakers.

Core Technologies: Intelligent

Situational awareness and accurate asset tracking dramatically increases the capabilities available to commanders.

At the same time making available such a large amount of information to the commanders opens up different challenges: first of all how to present only the information needed to solve the current issue.

The use of an Artificial Intelligence Engine will provide intelligent filtering on the information, consistency checking on the planning operation and forecasting on the decision that is being made.

Core Technologies: Intelligent (Semantic Reasoning)

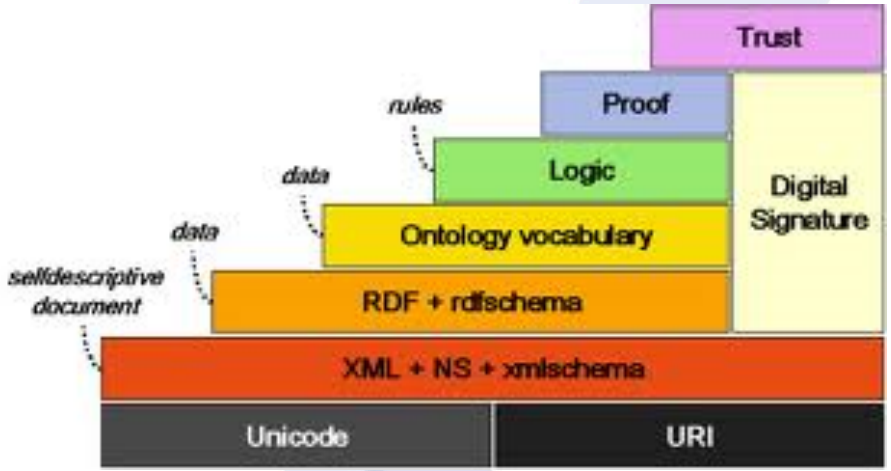
Extracting semantic information from both human communication and the sensor network allows us to keep updated a Semantic State of the World in the TANGO AI engine.

The State of the World is available to the commanders, to the semantic reasoner and to the simulation software in order to provide to the commander:

1- History of the Emergency

2- Current state

3- Possible Forecast



Core Technologies: Intelligent (AI)

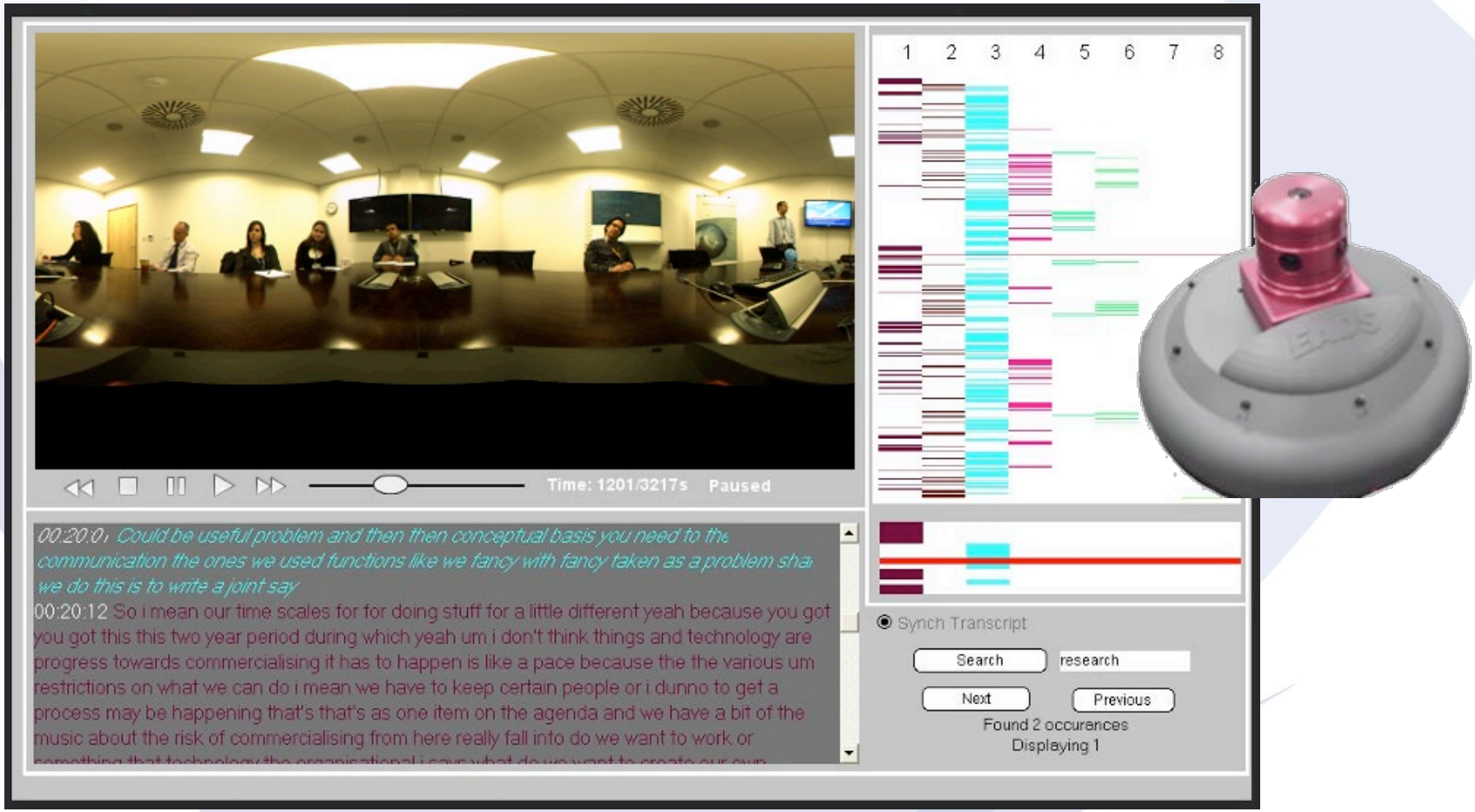
- Planner: Automatic planning algorithm will support the decision maker, providing executable plans according to the emergency, available resources, environment conditions, etc

- Issue Solver: Real time access to the ‘state of the world’ guarantees early detection of plan weaknesses or possible dehabilitation. Once detected TANGO AI can perform reinforcement and reparation on the original planning. In case an executable reparation cannot be found, a re-planning task will be necessary.

Core Technologies: Intelligent (Agent Based Simulation)

Reproduce a realistic virtual battlefield encompassing the entire "sensor" to "shooter" chain, including the command, control and information. The ability to reproduce and simulate the crisis in action encompassing the entire sensor to rescue chain, including the command, control, information network, asset and sensors results in more accurate and detail forecast. In addition the Intelligent agents can replace real assets in the State of the World computation when the communication channel is not available.

Fully Auditable Recording for Mission Reversal (1)



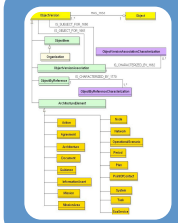
Fully Auditable Recording for Mission Reversal (2)

Automatically generated transcripts, person identification and topic segmentation allow fast information retrieval.

All the C2 tasks (sensors, planning, communication, etc) are recorded and indexed for mission reversal.

The virtual operation centre (VOC) can now be used as a synthetic environment in which the recorded tasks can be played back. The playback will allow the review of the richly detailed recording in the immersive environment.

Mapping Needs to Solutions

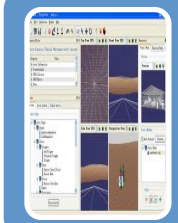


Engineering View

- Need to understand real-world environment and be able to test and evaluate in it

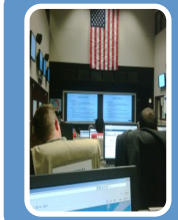
Operational Expertise

- Need a repository to capture doctrine and expertise
- Need to train with new equipment in multi-agent environment



Simulation design

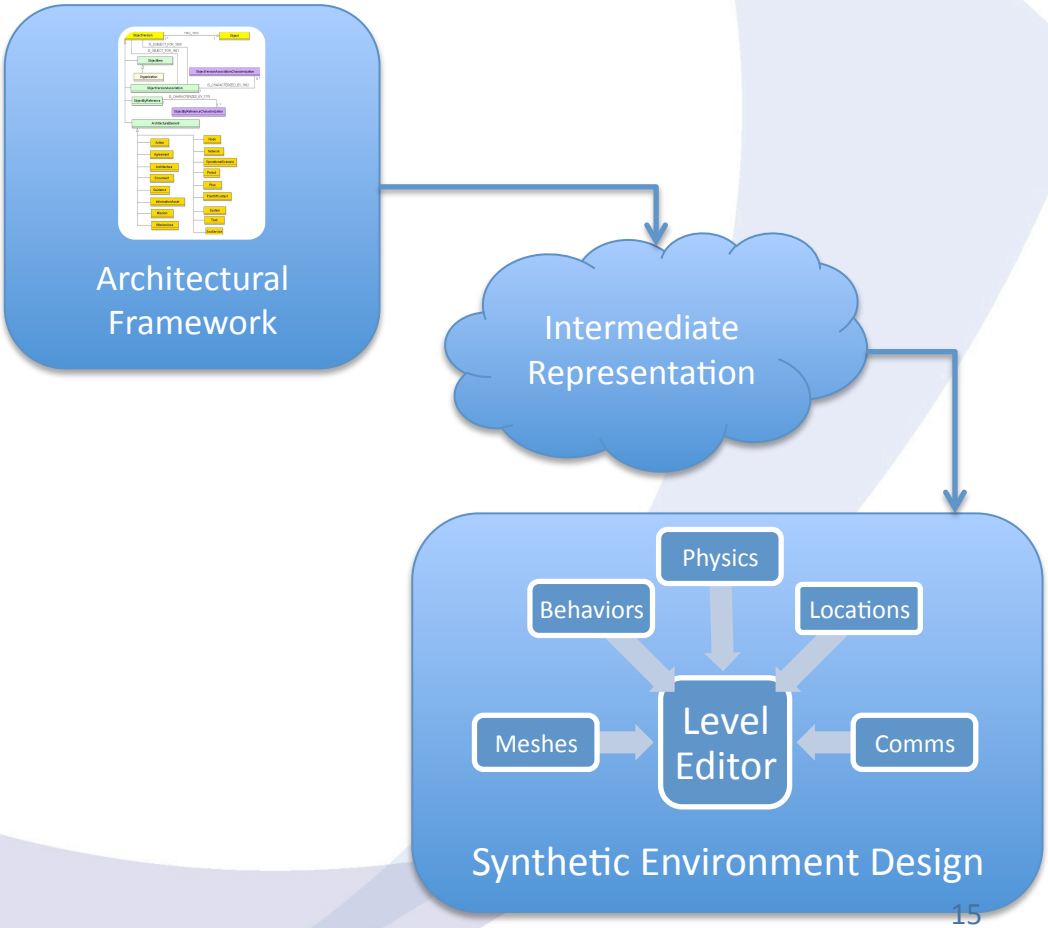
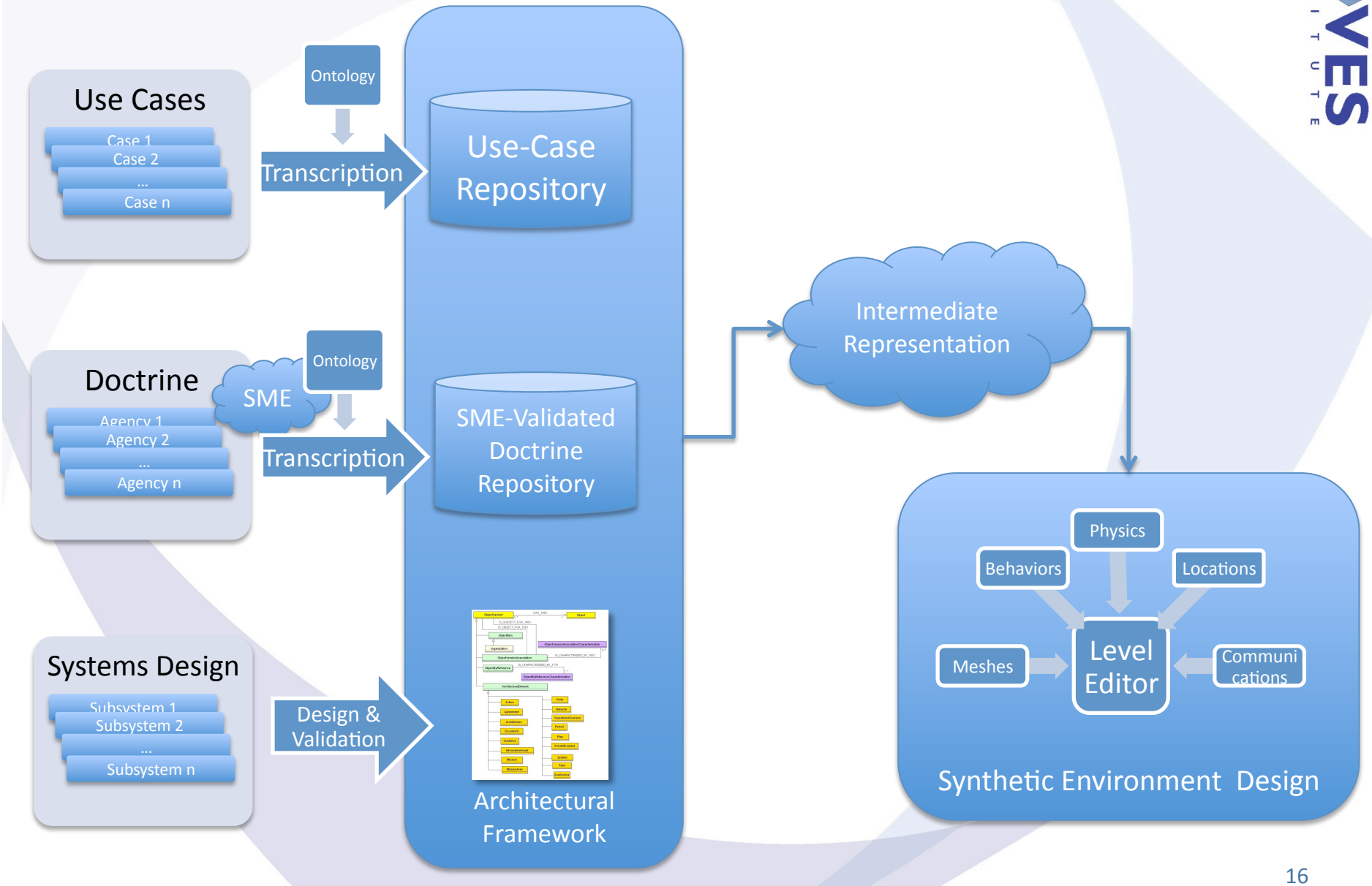
- Need to translate SME into synthetic environment
- Need to be able to easily integrate engineering models



Exercise and Policy

- Need a set of SME-validated test-cases and assessment metrics
- Need range of synthetic test beds

Provide a means to translate from Architectural Framework to Synthetic Environments using appropriate ontology and framework.



Bridge from Architectural Framework to Synthetic Environments