

# **NATO Modelling & Simulation Group (NMSG) Workshop Exploiting Commercial Games and Technology for Military Use**

## **Summary of Proceedings**

### **1. PURPOSE:**

The purpose of this summary of proceedings is to document the NATO Modelling & Simulation Group (NMSG) MSG-093 Workshop on Exploiting Commercial Games and Technology for Military Use In NATO.

### **2. OBJECTIVE OF THE WORKSHOP:**

The aim of the workshop is to share national experiences, explore commercial and games technologies, understand best practices, and to identify barriers to further exploitation and ways these barriers might be overcome. In particular, the workshop will investigate issues surrounding virtual worlds and similar technologies as they apply to using these technologies in military applications. Three dozen experts will join together at the new M&S Centre of Excellence in Rome to discuss, debate and determine the future steps required to ensure that the interoperability of virtual world use in NATO is a success. The workshop will include a recap of the key points from MSG-074 and MSG-078 held in 2009, and is followed by presentations and discussions. The investigation will include a definition of the challenge, development of an understanding of what needs to be overcome and possible solutions to the challenge. This methodology will enable the development of a consensus strategy by participants as to how they may continue to further exploit these technologies.

### **3. WORKSHOP AGENDA**

#### Tuesday 2 November 2010

1330 – Administration and Welcome

1345 – Keynote – “The Experiential Based Learning Renaissance – Putting Serious Games and Virtual Worlds in their Places”

1430 – “What Has NATO Been Doing?”

1530 – “Intersections and Differences / Virtual Worlds and Serious Games”

1615 – Virtual Reality Simulation for Disaster Response Training

#### Wednesday 3 November 2010

0845 – Daily Review

0900 – “Virtual Worlds: the Real World Analogies”

1030 – “Exploiting VBS2, Open Source, and Consumer Electronics for Research and Training”

## Technical Evaluation Report

- 1115 – “NATO Implementation of Training Technologies”
- 1200 – “Strategic Simulation Software”
- 1330 – “VBS2 Technology on Thin and Mobile Devices”
- 1415 – “Integrating Cultural Simulations into Virtual Worlds”
- 1500 – “Virtual Worlds Architectural Framework”
- 1600 – “Virtual Worlds: Next Steps for Interoperability”

Thursday 4 November 2010

- 0845 – Daily Review
- 0900 – “Ground Truth – An Open Architecture to Support a Common Virtual World”
- 1030 – NATO M&S COA POW
- 1100 – M&S COE Facility Presentation
- 1130 – Technical Evaluation Report
- 1200 – Workshop Wrap Up

## 4. PARTICIPANTS

COL Francesco Masterosa	Ramin Danisiro	Chiaretti Lamberto
Wayne Buck	Craig Swift	Paolo Zaghi
Matt Spruill	Edward Jones	Paolo Prioetti
Peter Morrison	Hans-Werner Lindert	Andea Comite
Paul Roman	Jiri Pail	Jerzy Gryzb
Lewis Johnson	Agatino Mursia	Daniusz Pierzchala
Paul Thurkettle	Petr Pavlu	Marius Van Wungaarden
Allan Gillis	Luca Gargiulo	LCdr Dimitrios Fillagos (Remote)
Stu Armstrong	Juan Ruiz	Angelo Prevetì (Remote)
Marco Van Wijngaarden	Julie Tremblay	Colin Bigg (Remote)
Tracey Cheasley	Meelis Soukland	David Smith (Remote)
Ron Edwards	Lauro Reino	Federico Guano
Carlos Alberto Belinchon Pinedo	John Milam	Oystein Ramseng
Hilde Hafnor	Tim Mahoney	
Patrick Samama	Mabel Mussini	

## **5. EXECUTIVE SUMMARY OF PRESENTATIONS**

### **5.1 The Experiential Based Learning Renaissance – Putting Serious Games and Virtual Worlds in Their Places by Dr. Paul Roman**

Dr. Paul Roman provided the keynote address to the workshop and his perspectives on Serious Games, Virtual Worlds, the Future Immersive Training Environment (FITE), and evidence of learning effectiveness. Dr. Roman began with a short history lesson and the simulation renaissance caused by the emerging from the decade of darkness where training and learning moved from live classroom to serious games to virtual worlds to technologies such as the Future Immersive Training Environment (FITE). He then described some experiential learning guidelines and how serious games met tactical training requirements. His Training Needs Framework presentation led to his analysis and proof of the efficiency and effectiveness of serious games for training using the Armour Troop WO Course as an example. In this portion of his presentation, Dr. Roman provided evidence of a nearly \$50,000 savings through the use of VBS2 in the training curriculum as well as an increased pass rate from 72% to 100%. He provided additional evidence from studies and experiments in Australia, the United States, and the United Kingdom. This all led to a definition of Roman's Rule: Given a robust set of serious games rehearsals that, 1) Create an adequate degree of immersion or presence in a meaningful context, 2) Employ good experiential learning guidelines, and 3) Employ good After Action Review; Trainers can expect to go from 75% to 95% effective in about half of the time that would have been required with live training on its own.

Dr. Paul Roman continued his presentation with a description of what is a virtual world and attributes of virtual worlds, and how they can be viewed or utilized within the US Department of Defense's Development of Interactive Multimedia standards. Dr. Roman then transitioned to the FITE program. Dr. Roman described the technology of the OD1 FITE Joint Capability Technology Demonstration (JCTD) as well as the four investigative areas. He then provided analysis and the outcomes of the first two objectives: Realism and Effectiveness. In conclusion, he asked two questions that set the tone for many of the discussions throughout the workshop: 1) Can we afford all these technologies, and 2) Is it a serious game or a virtual world, and does it matter?

### **5.2 What has NATO Been Doing? By Wayne Buck, NATO ACT**

Wayne Buck provided a presentation of NATO ACT's foray into virtual worlds through a description of their activities in virtual world development and experiments as well as background on NATO ACT's M&S activities and responsibilities. Mr. Buck began with description of NATO ACT's investigation into virtual worlds. He described the experiments that NATO ACT has conducted in collaboration with JFCOM and industry partners to determine the efficacy of training staff officers in a virtual world, as well as the recent development of a virtual world of the new NATO ACT building and a training game based on a virtual world for the NATO Maritime Interdiction Operations Training Center. Mr. Buck then provided the history behind NATO ACT's involvement in the M&S community by describing the ACT organization and its relationships within the NMSG and other NATO organizations leading up to the "Ambition Continuum." The "Ambition Continuum" being the activity areas of Infrastructure and Process Development, CAX Forum and CAX Courses, Education and Training, Applications and Networks, and Interoperability and Standards cross matrixed with the four deliverables or products of the Afghan Mission Network (AMN), Snow Leopard, the Distributed Networked Battle Labs, and the Common Technical Framework. Mr. Buck concluded with the challenges NATO ACT faces: level of ambition versus possible level of effort, integration into the existing NATO M&S community, and resources in general.

### **5.3 Intersections and Differences / Virtual Worlds and Serious Games by Doug Whatley, Breakaway Ltd.**

Mr. Doug Whatley began his presentation with a discussion of definitions of different game types: virtual worlds, multi-player, massively multi-player, role player, and first person shooter; and then surmised that most people or customers use them interchangeably but, in fact, their mechanics make them different experiences for the user. Mr. Whatley used the analogy of two popular board games that had similar themes but different mechanics which made them different experiences for the players – Risk and Diplomacy. Both have similar themes of world conquest, territorial control and army tokens. But both have differing mechanics. Risk employs sequential turns while Diplomacy employs simultaneous turns. Risk employs probabilistic combat while Diplomacy employs deterministic combat. This example provided the background behind the remainder of his presentation - the experience a user has in different game types is due to the mechanics of the user view and controls. He pointed out the different movement techniques such as point and click for direct movement versus the W-A-S-D method of movement in the different game types as well as the view the user has during game play and how different employment techniques of textures, lighting, eye focus, and pathing are used to create the experience for the user. During the presentation much discussion occurred around the ideas of the buy versus make decision, what is the right answer on reuse of code, applying the technology to the training, standardization, and the notion of what is good enough. Mr. Whatley concluded with, the answer to the user experience and the right application of the technology is in the design.

### **5.4 Virtual Reality Simulation for Disaster Response Training by Marco Van Wijngaarden, ETC Simulations**

Mr. Marco Van Wijngaarden presented an overview of Environmental Tectonics Corporation, and overview of the Advanced Disaster Management Simulator (ADMS) and a description of a recent practical application of ADMS. ADMS is a simulator replicating a real situation to train coordination center staff, field commanders and vehicle operators during emergency operations. ADMS employs accurate incident and locations, real-time dynamic simulations, embedded AI + physics based threats, and an immersion theater. Mr. Van Wijngaarden described a recent application of ADMS called the New York Project. In doing so, he described the requirements of the system to meet the training objectives. He pointed out the levels of terrain fidelity required, the fidelity and breadth of the vehicles required to provide realism, the types of injuries and graphical display of the injuries on the characters, and how the incident field commanders interfaced with the simulator. Mr. Van Wijngaarden displayed numerous example screenshots throughout the presentation that highlighted the ADMS capability. The key discussion point with the group centered around the level of fidelity required for any system and whether or not geo-specific or geo-typical terrain is really required.

### **5.5 Virtual Worlds: the Real World Analogies by Stu Armstrong, QinetiQ**

Mr. Stu Armstrong presented real world examples of very popular games and how they can and have been used for purposes other than entertainment. Mr. Armstrong began with the question of what is a virtual world and referenced Ola's Law About Laws and Dr. Cat's Theorem to guide his points. He then used three popular games to highlight applications of games for learning and training: World of Warcraft, Eve Online, and I Love Bees. In the World of Warcraft example, Mr. Armstrong displayed a video capture of a team preparing for battle. This highlighted the mission briefing and leadership actions necessary for successful mission accomplishment. He also pointed out that because an online game used daily by millions of players can have language challenges, a US university taught language skills by having their students log into German language World of Warcraft servers to facilitate the teaching of the German language. Additionally, he pointed out an article about how infectious disease research can be conducted in an MMO. In the Eve Online example, Mr. Armstrong described the game and its environment. He spoke about the Eve Economy and how in game money has been stolen; how Eve wars have been planned, rehearsed, and conducted; and

how intelligence has facilitated the conduct of the wars. Most importantly he highlighted how a rehearsal was conducted in Second Life for a war in Eve Online to protect the security of the plan while still offering a rehearsal site for the operation. He concluded that we can and should take advantage of these games to train for operations. In the final example, Mr. Armstrong showed how the game, I Love Bees, was used as a marketing campaign for Halo 2.

### **5.6 Exploiting VBS2, Open Source, and Consumer Electronics for Research and Training by Allan Gillis, Defence Research and Development Canada**

Mr. Allan Gillis presented the Defence Research and Development Canada's (DRDC) work in the development of vHarbor and the vRHIB, the recent application of the system in support of a security event, and lesson learned throughout. Mr. Gillis began by discussing vHarbor. He presented the purpose of the work – research of the command and control systems of a ship in port for local protection. He then described the layout of the base operations center, the system design and components, the details of the equipment used in the system, and a layout of the facility. He displayed pictures of the vRHIB and the transition of the vHarbour system to the vRHIB system that was used to train personnel for security operations during the Canadian Navy's 100 year celebration. Mr. Gillis highlighted the significance of the system as the port security detail, which was newly formed, used the vRHIB to train for the event. He concluded with lesson learned from the program: trainers need more time to integrate new tools into their lesson plans, vRHIB is still more complicated than it needs to be for the training community, some of the game hardware was too fragile, USB headsets limit what you can do with sound, and if all players are in one room the radios probably aren't needed.

### **5.7 NATO Implementation of Training Technologies by Paul Thurkettle, NATO ACT**

Mr. Paul Thurkettle presented an overview of the Education & Training Technologies Section's mission and what Advanced Distributed Learning means to NATO, the NATO schools, challenges for learning, overall challenges, and the future outlook of their projects. Mr. Thurkettle presented the NATO ADL vision and what it means in practical terms. In a nutshell, it means "eLearning." Mr. Thurkettle then provided an overview of the NATO Education and Training facilities and the different NATO networks supporting ADL. He presented his challenges for learning as: stop "death by powerpoint" in courses, promote "peer learning," syndicate and teamwork, apply knowledge, use simulation to enhance individual training, use distributed learning and training to reinforce learning, time limitations, resources, and meet new "just in time, just enough" policies. His overall challenges are: the first look at a new technology or system is very important to gain support; the name is very important – is it a virtual world or a serious game; a deliverable must be delivered; his customers are expecting state of the art in new systems; and new systems must appeal to and apply to all ranks from four star to no star. Mr. Thurkettle then presented the future of NATO education and training as, in general, mobile devices, web and computer based training, and serious games and virtual worlds. Specifically, he presented three products: NEXUS virtual worlds use in staff training and the NMIOTC ship boarding training, VBS2 for applications such as Counter-IED training, and Tactical Language & Culture Training Systems. Mr. Thurkettle presented NATO ACT's investigation into mobile devices.

### **5.8 Strategic Simulation Software by Tracy Cheasley, NATO ACT**

Mrs. Tracey Cheasley provided an overview of NATO ACT's effort in the use of a strategic level simulation, the lessons learned, and a demonstration of the simulation. The challenge she was faced with was how to provide a training tool at the strategic level (not necessarily a 3D tool) that would replace an old paper based system. The lessons learned are categorized into two topics: the tool and the process. While they had a firm starting point and a clear aim, it was sometimes difficult to have a clear understanding of the requirements, and it was difficult to have an understanding of how to ask the developers the right questions during the development of the simulation. For the process lessons learned, they had to have a realistic compromise

between the desires and the available resources as well as developing the precise requirement. In the end, they chose Command in Chief as the simulation to meet their need. Mrs. Cheasley concluded with a demonstration of the simulation software.

### **5.9 Fusing VBS2 and Thinking Worlds by Peter Morrison, Bohemia Interactive Simulations**

Mr. Peter Morrison presented an overview of VBS2 along with new features and future enhancements, an introduction to Bohemia Interactive Studio (BIS) and Bohemia Interactive Simulations (BISim), a new system called VBS Worlds, and his perspective on the term “virtual worlds.” In his description of VBS2, Mr. Morrison presented the history of VBS2 along with the increases in fidelity of the system through the years. He also discussed new enhancements in progress such as paging terrain and an API for SE Core integration. Mr. Morrison also discussed several limitations; the fact that VBS2 is a single platform thick client application, and it is tailored for tactical training and mission rehearsal not addressing many other training needs. His mention of VBS2’s limitation lead him to his next topic: introducing a new system, VBS Worlds. VBS Worlds is a fusing of VBS2 and Thinking Worlds from Caspian Learning that will allow for rapid scenario generation as well as thin client or mobile delivery. Mr. Morrison used the example of VBS2 Insurgency Mindset Training Network Enabled Training (IMT NET) for the USMC that allows for persistence and multiplayer interaction thereby making it a virtual world by definition. He mentioned this specifically because he does not want to be excluded from competition because a government does not consider VBS2 a “virtual world.” He believes that, “If it is a virtual representation of a world, then it is a virtual world.”

### **5.10 Integrating Culture Simulations into Virtual Worlds by Dr. Lewis Johnson, Alelo**

Dr. Lewis Johnson presented the challenges of culture and language skills; the requirements of an operational language and culture suite; and an in-depth description of the architecture, design, and application of Virtual Role Player (VRP). As described by Dr. Johnson, intercultural skills are increasingly recognized as important for NATO operations, but language and culture proficiency can take a long time to develop, and once developed they can be difficult to maintain. Therefore, an operational language and culture training suite must be a coordinated set of distributed learning tools, that can be used individually or in combination, that addresses the readiness and sustainment problem, and the underlying technology is compatible with virtual worlds. Alelo’s answer to the above problem and requirement is the Virtual Role Player (VRP). VRPs are artificially intelligent non player characters that perform culturally appropriate roles, that can engage in spoken dialog with trainees, can gain rapport with the trainees, can assess a trainees cultural skills, are instructor configurable, can integrate with multiple game engines, and have versions for Dari, Pashto, Arabic, and French. VRPs can be used to interact with users in three different ways; in language mode, in culture mode, and in a puppet or controller manipulated mode. Additionally, VRPs can be integrated into language and culture training systems, kinetic training systems such as VBS2, or mixed / augmented reality training systems.

### **5.11 Virtual Worlds Architectural Framework by David Smith, Lockheed Martin**

David Smith presented the preliminary findings as a result of an effort sponsored by the US Office of the Secretary of Defense to determine a DoD wide virtual world framework. Mr. Smith presented a description of the Virtual World Framework that is scalable, future-proof, interoperable, and secure. The essential features of the next generation virtual world platform must: work across operating systems and devices, be easily deployed across an entire organization on both sides of the firewall, work with existing IT capabilities and security requirements, avoid being a captive solution, utilize and define standards, scale dynamically with new requirements, and lower the cost of content development while raising the level of quality and affordability. Mr. Smith then transitioned to the delivery mechanism of the virtual world framework, a browser based solution. He described the future of virtual worlds in terms of WebGL and HTML5, and

provided answers to why a browser-based solution in terms of the essential features mentioned previously. He also expounded on where the browser is headed and what the major browser vendors are currently doing. He concluded with speaking to his current activities in the conduct of the study.

### **5.12 Virtual Worlds:Next Steps for Interoperability by Matt Spruill, Engineering & Computer Solutions**

Matt Spruill presented an overview of Engineering & Computer Simulations (ECS); an overview of the virtual world effort for NATO ACT; a demonstration of Boarders Ahoy!, a game based on the NEXUS Virtual World platform; and an operator's view of 5 levels of interoperability that the community should strive to achieve in the future. Mr. Spruill presented ECS's core capabilities and then provided greater detail of their NEXUS Virtual World platform and examples of serious games for training and education developed by ECS. He then provided an overview of the NEXUS Virtual World developed for NATO ACT both for the new headquarters building and the ASIA compound that was previously utilized during an experiment as a game in an effort to determine the efficacy of using virtual worlds for staff training. Mr. Spruill then provided a live demo of a game based on the NEXUS Virtual World platform called Boarders' Ahoy! in support of the NATO Maritime Interdiction Operation Training Center. Mr. Spruill presented his ideas on the levels of interoperability that the virtual world community should begin to work towards. The first level, called Basic, would share simple information about a person or avatar such as name, age and gender from platform to platform. The second level, called Profile, would be the sharing of a complete profile analogous to Linked In sharing a profile with Facebook. The third level, called the Window, would be where a person represented by an avatar could see from his world into another virtual world through a window. The fourth level, called the Door, would be where an avatar could not only see through a glass door from his world into another, but then he could open the sliding glass door and step through into the other virtual world. Finally, the fifth level, called Behind the Door, would allow an avatar from one world to enter another, and then physically interact with objects and other avatars in another world. Mr. Spruill concluded with stating that this is necessary because our customers are demanding these capabilities and driving us to them.

### **5.13 COTSEU Aviation Tactical Training by Stu Armstrong, QinetiQ**

Mr. Stu Armstrong delivered a second presentation providing an overview, the requirements analysis, and initial findings of an investigation into a COTS solution to support theater specific tactics training for the Apache, Sea King, Puma, Chinook, Lynx and Merlin helicopters. Recently, the UK Joint Helicopter Command has requested that COTSEU conduct the investigation. The primary problems identified were that current tactics trainers focused primarily on the AH community and the current solutions are inflexible, expensive and slow to develop compared to the COTS based solutions. Requirements included: key instruments represented, rapidly reconfigurable, mobile, and use COTS solutions where possible. Based on the requirements and interviews, a VBS2 demonstration was conceived providing a single simulation to represent the current operational environment within an immersive environment. They concluded from this that VBS2 and COTS technology is capable of producing a wide field of view, VBS2 engine allows for highly detailed geo-specific terrain to enhance training value and levels of immersion, and the instrumentation method employed allows for the rapid construction of any instrument. The final conclusions of the investigation were that availability of certain hardware such as flight control grips are an issue, GPUs have advanced during the investigation and have alleviated the initial graphical performance issues, it is possible to create a targeted fidelity tactics trainer for support helicopters using COTS at a significantly lower cost than traditional methods, and development timelines using COTS are dramatically reduced compared to traditional simulation methods.

### **5.14 M&S Center of Excellence by COL Francesco Mastrorosa**

COL Francesco Mastrorosa gave a presentation on NATO's Modeling & Simulation Center of Excellence. He explained the relationships between the M&S COE and other agencies in the NATO organization. He

reviewed the M&S COE mission and goals. COL Mastrorosa described the M&S COE facilities and the organization of the staff manning the COE. His presentation included numerous pictures of the facilities including mock-up diagrams of rooms still under construction. COL Mastrorosa explained the COE Accreditation Roadmap and where the M&S COE was in the process with an anticipated M&S COE Accreditation of December 2011. He described the four core areas of the M&S COE as: support to NATO and the Nations, additional support to the Nations, collaborative relationships with industry, and collaborative relationships with academia. COL Mastrorosa described the M&S COE's possible priorities of work within the areas of training, analysis and lessons learned, concept development and experimentation, and doctrine and standards. Finally, COL Mastrorosa explained the benefits of joining the M&S COE. Following his presentation, he led the group on a tour of the facility.

## **6. CONCLUSION AND RECOMMENDATIONS:**

### **6.1 Central themes throughout the workshop:**

During the course of the workshop several themes or key issues arose sparking much discussion including:

- Definitions – Paul Thurkettle stated that names are important. Numerous times, presenters brought up the issue of what constitutes a virtual world.
- 2D or 3D? – The group discussed, during several presentations, whether or not 3D was a required component of a virtual world or game to be immersive. It was agreed upon by the participants of the workshop that 3D is not required.
- Persistence – Some in the community state that persistence is a required component of a virtual world. Many at the workshop disagreed with that particular statement.
- Contracting and Request for Proposal language – Related to the definitions issue, several presenters, both government and industry, highlighted that government RFPs may be limiting a potential valuable solution by specifically requiring a virtual world or a game.

### **6.2 Workshop position regarding definitions; serious games, virtual worlds, massive multiplayer online games.**

As an emerging suite of education and training technologies it is clear that these experiential-based learning tools should be simply categorized as immersive technology. That is to say that the participants are required to take on a particular role within a scenario that causes them to achieve a degree of presence that enables meaningful achievement of specific objectives.

There was a general consensus at the meeting that additional labels of the type listed above were artifacts based upon the need for vendors and early adopters to communicate meaningfully about initial capabilities that have evolved significantly since they were first applied. It is likely that these terms will endure as they are imbedded in the names of some products and even organizations. However, it is agreed that the family of immersive technologies discussed during this workshop has considerable overlap in terms of their applications and as a result, using the initial classification scheme in requirements documentation is likely to artificially limit the ability of vendors to participate in the competitive process.

Sample Requirement statement: Using immersive technology running on this *type of computer system* provide experience-based training to allow trainees to demonstrate that they have achieved a specific level of language capability.



### **6.3 Conclusion**

With the aim of the workshop to share national experiences, explore commercial and games technologies, understand best practices, and to identify barriers to further exploitation and ways these barriers might be overcome; and then to investigate issues surrounding virtual worlds and similar technologies as they apply to using these technologies in military applications, the workshop was a success. There was much discussion involving the entire group on these issues. Particularly notable is the position statement that was crafted by Dr. Roman based on his observations of the debates and agreed upon by all at the workshop.

### **6.4 Recommendation**

- MSG-093 represents a logical progression from discussions of only serious games to including new technologies called virtual worlds and immersive environments. This series of workshops should continue to progress and perhaps involve topics such as mobile device delivery means.
- Continue to sponsor and conduct the Exploiting Commercial Gaming and Technology for Military Use workshops as it provides an enterprise view of new technology as well as individual nation's applications of them. Using workshops in this manner facilitate NATO and ACT's role in standards, interoperability, and best practices as well as highlighting new technologies.
- Continue to be an example in the application of new technologies by offering a distributed, collaborative means to participate in the conference from remote locations.
- Utilize the M&S COE facility as the meeting place for the workshop. The facilities are well suited for this type of workshop. Additionally, the staff of the M&S COE benefits by maximum participation in the workshop.

