



## Project 8K: The World's First Dual Synchronized 4K Streaming Video

By: Joan Ackerman



Jeff Malnick of the MOVES Institute sets up one of only three 4K prototype cameras in existence at the Monterey Bay Aquarium. NPS ITACS staff and MOVES researchers provided the technical expertise for a first-ever, synchronized dual 4K ultra high-definition video stream.

A demonstration of "Project 8K" – the world's first dual synchronized 4K streaming video – was a highlight of the fourth annual CineGrid International Workshop held at the California Institute for Telecommunications and Information Technology (Calit2) in December, and experts from MOVES helped make it happen.

Using two of the only three JVC prototype 4K cameras in the world, two 3840 x 2160 pixel images were streamed live during a 45-minute remote observation from the Monterey Bay Aquarium via NPS to Calit2 at the University of California San Diego, and

and providing the technical guidance. Jeff Weekley, Research Associate at the MOVES Institute, supervised the special demonstration. To produce the streamed images, NTT lent their JVC cameras, Mark I and Mark II, high-quality video recorders and a variety of Nikon F-mount style lenses to NPS to stream and record the underwater habitat.

With the support of Fred Cohn of the City of Monterey, Doug Weismann of ITACS, and the NPS "Project 8K" team prepared and tested the system which required network upgrades at the Aquarium and an accelerated timetable for planned upgrades to the City's network infrastructure. Alignment of the dual 4K images was rehearsed in the Dark Mirror Lab in Halligan Hall, so that the field recordings and the live streams could be aligned in real-time.

Field experiments included images of Asilomar Beach at sunset, and marine life at Moss Landing, where focus and aperture challenges were resolved. Additionally, a large contingent of the NPS Cycling Club rode out to Asilomar on the first day of field tests to provide drama and fast action. At CineGrid, the 8K images streamed from the MBA involved synchronizing two JPEG2000-compressed images from

from there to NTT Network Innovations Laboratory in Yokosuka, Japan. "Every year, we set out to impress Hollywood with what we're doing in the research community," says Calit2 research scientist and a founding member of CineGrid, Tom DeFanti. CineGrid is a non-profit international consortium that seeks to build an interdisciplinary community focused on the research, development and demonstration of networked collaborative tools, enabling the production, use and exchange of very high-quality digital media over high-speed photonic networks. "This year, we showcased our fully-evolved capabilities in distance collaboration for 4K editing and sound." Laurin Herr, President of CineGrid, was instrumental in arranging the experiment

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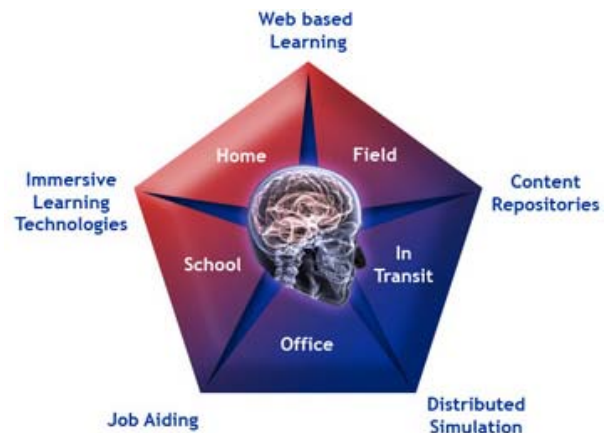
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### MOVES and ADL Establish Long-Term Working Relationship

Written By: Paul Chateller

The Memorandum of Understanding (MOU) recently signed between Advanced Distributed Learning (ADL) and the Naval Postgraduate School (NPS) MOVES Institute establishes a long-term working relationship to develop capabilities within the armed forces related to modeling, simulation, training, and human systems integration.

The Advanced Distributed Learning (ADL) Initiative is a collaborative effort to harness the power of information technologies to deliver high-quality, easily accessible, adaptable, and cost-effective education and training. ADL uses structured and collaborative methods to convene (Continued on page 5)



Above is the ADL Pentagon of Learning Acquisition, demonstrating the 5 ways of getting learning content.

## Where Are They Now? Alumni Update Featuring: LCDR Jason S. Jones, U.S. Navy



**MOVES Alumnus Jason S. Jones in his new post as Chief of Civil-Military Operations (J35).**

Since leaving the MOVES Institute in 2006, LCDR Jason S. Jones has launched into a new role as the Chief of Civil-Military Operations within the J35. LCDR Jones is working at the Joint Functional Component Command for SPACE (JFCC SPACE), in Vandenberg AFB, CA (a component command of USSTRATCOM). LCDR Jones' thesis, 'Modeling Detection Strategies to Battle Improvised Explosive Devices' was recently the basis for a paper that was accepted for publication in the Military Operations Society (MORS). The paper is entitled "Efficient Employment of Non-Reactive Sensors," and can be found at <http://faculty.nps.edu/mkress/kresspa.htm>.

We recently caught up with LCDR Jones to ask him a few questions about his current work and how his experience at MOVES prepared him for his career in the navy.

### **What is unique or interesting about the place you are currently stationed?**

When I am not spending time with my family and enjoying each new joy that comes with a beautiful six month old, I enjoy running, reading, and trying to stay up to date with all the new technologies out there, specifically all the happenings in the open source community. The interesting thing about Vandenberg AFB is that it is an Air Force base that doesn't have any aircraft assigned. Much of the personnel here support space launches, typically a Delta series or Atlas V rocket; however, the payloads vary. It's impressive to witness the power of these delivery vehicles; they literally shake the windows in the house.

### **What are you working on and how does it relate to M&S?**

I've recently transitioned to a new job at the beginning of this year.

In fact, it was because of my background in M&S that I was chosen to start working on this relatively new project. I spent my first year at JFCC SPACE doing operations planning for the assigned space control forces in support of OIF/OEF. It was rewarding work, however, it did not leverage much, if any, of the skill set that I obtained from the MOVES program. Though, as a result of my background in M&S, I have transitioned to be the military representative for the J3 (Operations Directorate) working on a Space Situational Awareness (SSA) augmentation project for the Joint Space Operations Center, or JSpOC. This project is very much M&S related; it models where satellites are now, and where they will be, given some point in time in the near future. It may sound simple, but the calculations involved are computationally expensive, complex integration problems.

### **What is the problem you are trying to solve?**

Essentially, we are trying to model whether or not the potential exists for two satellites (or a satellite and any other space object, for that matter) to collide in orbit around the earth. Specifically, this process is called Conjunction Assessment (CA), where we determine close approaches between two objects provide warning to satellite operators if it meets certain thresholds. With the cataloged number of space objects in the tens of thousands and growing daily from breakups, collisions, and new launches; this problem is not trivial.

The current conjunction assessment system has a number of limitations due to aging hardware, and is unable to do CA screening of all space objects against all others in the catalog, which we refer to as 'All vs. All'. The value of doing this is two-fold: it gives the JSpOC much greater flexibility in day-to-day operations, and enables other activities, such as simulation and modeling potential space operations scenarios. We are looking to augment the current system with a solution built on commodity hardware and software with the goal of achieving reliable results for All vs. All runs.

### **What are the applications you are using? What systems do you work with on a regular basis?**

Primarily we use the Satellite Toolkit (STK) developed by Analytical Graphics, Inc (AGI), among other commercial off-the-shelf (COTS) and government-off-the-shelf (GOTS) software. We are running these tests on commodity workstations purchased directly from Dell. In preliminary tests, we have been able to accomplish All vs. All runs to the same accuracy as the current system using a sub-set of the current operational data set, but on the order of 4100% faster.

The challenge we have ahead of us is integrating this capability into the current operations center

baseline, and handing it over to a program office to sustain. Though much of the software is proprietary, we are leveraging open architectures and open standards to automate the process and developing customizable web based interfaces to display the data to the operators.

We are really in the infancy of this project, although we have achieved significant results in a short period of time. Being a non-program of record, the funding for the project is wherever we can find the money. We have defined requirements to hopefully help push along the acquisitions process to bring this capability to the warfighter sooner rather than later. Due to the quality of our results and the importance of the mission to JFCC SPACE, we've garnered Flag Officer level attention, and expect to move this capability quickly from testing to execution.

### **What aspects do you particularly enjoy about your position, what's the best part of your job?**

The best part of the job is that I'm continually learning new things. As one of the Navy's Informational Professional Officers, with a background in core systems programming and architecture, I've wanted to get my hands dirty with the latest advances in web technology. There's no better motivator or enabler than a real world problem to inspire you to learn what you need to know.

### **Any advice for current MOVES students?**

The best advice that I can give current MOVES students is to gain a fundamental understanding of open standards and open architecture. Specifically, how they relate to getting data/information generated by the simulations to the individuals who need it, who often times have only a web browser to display the data.

### **Talk to us about your experience as a MOVES student, how has it impacted your career development?**

The program has had a huge impact on my career development simply by exposing me to an interesting and challenging field that I would have otherwise, most likely, not have found. I plan to seek every opportunity to work in the M&S field for the remainder of my time in the Navy, and likely will continue to pursue the career field once I retire.

## Director's Corner: A Word from CDR Sullivan

### Updates About What's Taking Place Within the MOVES Institute

Congratulations to MOVES 2009 graduates as they transition to ever-more successful and bright futures. On behalf of the MOVES Team, I'm delighted to highlight recent additions to the elite cadre of individuals that can claim an entirely unique blend of operational excellence and technical expertise in the demanding emergent field of modeling, virtual environments and simulation. Within the last year the following individuals have completed the demanding MOVES program:

#### **Graduated June 2009:**

Both of the following graduates received their Ph.D. in Modeling and Simulation,  
-LT Patrick Jungkunz, Navy, Germany  
-Maj. Christopher McClernon, USAF\*  
\*McClernon received the Air Force Association Award for Outstanding U.S. Air Force student.

#### **Graduated September 2009:**

-LT Heiko Abel, Navy, Germany\*\*  
-LCDR Joshua Burkholder, USN  
-Capt. Serhat Camur, Air Force, Turkey  
-Maj. Christian Fitzpatrick, USMC\*  
-LT Kenneth Maroon, USN  
-LT Jason Nelson, USN\*  
-LCDR Tariq Rashid, USN  
-Maj. Craig Schwetje, USMC  
-LCDR Jeffrey Williams, USN  
-Civ. Yew Chong Foong, Singapore  
\*Recognized for Outstanding Thesis.  
\*\*Recipient of the George L. Phillips Award, Outstanding Thesis, and for graduating with distinction.

The most recent additions are:

#### **Graduated March 2010:**

-LT Sheldon Snyder, USN  
-Maj. Ben Brown, USMC – Recipient of the George L. Phillips Award, Outstanding Thesis, and for graduating with distinction.  
-LCDR Rich Morrison, USN – Outstanding Thesis.

The research front continues to expand in exciting directions with great promise for improved M&S tools for user communities.

#### **Increased Industry Research Opportunities and Collaboration**

In March we had the honor of hosting the Chief Technology Officer of EADS – Dr. Jean Botti. Dr. Botti and his team were favorably impressed by the progress and potential downstream research opportunities of the current ROGUEVIDEO project. The excellent work of Tony Ciavarelli, Perry McDowell and the Delta3D Team was instrumental in discovery of numerous potential future research opportunities. We are also extremely grateful to Simon Bradley, Head of Technical Capability Centre 5, and Simon's Head of Operations, Mr. Tony Bagnall, for their tremendous assistance in shaping the current research project.

Teamwork and an exceptional rapport have been hallmark of this effort. Based on the overlap in research interests and highly complementary nature of our organizations Dr. Botti and NPS President VADM Daniel Oliver have agreed to explore greatly expanded collaboration. We are currently aggressively investigating the feasibility of a Chair Professor within the MOVES institute. This is an exciting opportunity that could improve efficiency of both organizations and enable a whole much greater than the sum of the parts.

#### **Improved M&S for Information Operations Community**

On other very important research fronts, we've recently made significant strides toward advancing long-term research collaboration with the Office of the Director, Operational Test & Evaluation, Office of the Secretary of Defense. In late February DOT&E representative David Aland (CAPT, USN (ret)) visited to review and update a mutually-developed overarching strategy and collaboration structure focused on improving cyber defense training events. MOVES Principle Investigator Gurminder Singh reported excellent progress and was able to incorporate operational experience of students across several curricula in novel approaches to some of DoD's more pressing concerns. Again, the long-term prospects for this initiative for transitioning research outcomes are extremely promising. I look forward to reporting continued success along this important research theme.

#### **HSCB Seminar Series**

For our friends at the Naval Postgraduate School and anyone in the social science or computational modeling community, we'd like to highlight a special seminar series being hosted at NPS. The intent of the Human Social Cultural Behavior (HSCB) seminar series is to foster collaboration between the NPS social science community and the NPS computational modeling community in order to develop multi-disciplinary teams capable of conducting funded research in support of the OSD HSCB Modeling Program. Please contact MAJ(P) Alt, [jkalt@nps.edu](mailto:jkalt@nps.edu) to register for the seminar, and additional information.



**CDR Joe Sullivan, Dir. of MOVES.**

#### **Research & Education Summit 2010**

Registration is now open for the Tenth Annual Research and Education Summit (RES). The dates will be 13-15, July 2010. Special thanks to the session chairs who are putting together some very engaging portions of the RES. Some of the themes include: The Use of M&S for Distributed Learning, Simulation & Healthcare, Cornerstone Research Projects, Human Social Culture Behavior Modeling, M&S Sponsors Panel, MOVES Students Past & Present.

We are revising the format to increase interaction and allow more opportunities for outside speakers. If you have something that you'd be interested in contributing, please contact MOVES Deputy Director, Paul O'Connor, [peo-conno@nps.edu](mailto:peo-conno@nps.edu). RES. See the back page for more details on registration, agenda and accommodations.

We hope you can join us!

## **Career Opportunities with MOVES**

**Be sure to check the MOVES website for current openings:**

**[http://www.movesinstitute.org/about\\_career.html](http://www.movesinstitute.org/about_career.html)**

**Now Hiring: \* Research Faculty Member \* Research Assistant: Hardware/Software Engineer \* Just Added: Research Assistant: Web-Based and Virtual Collaboration \***



# The Delta3D Download

By: Erik Johnson



The *Download* is a new column that will be regularly scheduled featuring current news about Delta3D, the MOVES Institute's managed open source engine for serious games. The Delta3D team's rich experience in the video game industry, visual-simulation, and the military is the optimal mix for creating engaging and effective military training games. In this premiere edition, we'll get a closer look at key members of the team:

## Michael Day

Since joining the Delta3D team in December 2008, Michael's work has included enhancements to the audio portion of the Delta3D engine, the development of a port security software trainer for the Federal Law Enforcement Training Center, and creating a visualization tool to track a helicopter pilot's eye scan patterns. Michael graduated from the University of Alabama Huntsville with a Bachelor of Science in 2003, majoring in Computer Science and minoring in Mathematics. Before arriving at MOVES, Michael spent time as both a network administrator and software engineer supporting Army RDE-COM. He is currently pursuing a Master's Degree in Computer Science at NPS.

## "Mr. D"

The elusive Mr. D worked in the gaming industry for more than 20 years before coming to Delta3D as the 3D artist of the team. Mr. D has worked in numerous art-related positions over the years, from Entry Level 2D artwork through Lead 3D Artist. Mr. D's broad range of skills in art asset creation enables realistic visuals and immersive gameplay. When you see screenshots of a Delta3D application, chances are you're looking at some of Mr. D's handiwork.

## Michael Guerrero

Michael was rescued from the game industry grind in November 2006 when he was given the opportunity to join the Delta3D team. He holds a B.S. in Computer Science from UCSB and an M.S. in Interactive Technology from the Guildhall at SMU. Michael specializes in graphics and simulation technologies and has contributed to the success of commercial games on both the Nintendo DS and the PC. Currently, he is using his expertise to push the state of the art in simulation as the lead programmer for the Delta3D team.

## Eric Heine

Eric joined the Delta3D team after collaborating with Jeff Houde & Michael Guerrero on Liquid Entertainment's *Desperate Housewives: The Game*, which was named Adventure Game of the Year in 2006. Eric has a B.S. in Computer Science from University of California at Santa Cruz and is proud to be a Banana Slug (the UCSC mascot). Since coming to work with the Delta 3D team, Eric has focused mainly on user interface in applications, making the world a prettier and more intuitive place one program at a time.

## Jeff Houde

Jeff has been programming since high school where he first learned the wonders of Quick Basic. In the few years that followed, he has developed a passion for developing tools and other utility software. Jeff is a graduate of Full Sail University with a Bachelors of Science in Game Design and Development. Jeff worked at Liquid Entertainment and also helped create *Desperate Housewives: The Game*. After realizing the commercial game industry was not for him, Jeff came to the Delta3D team to develop his passion for the tools that he loves. To this day, if you're quiet and you don't spook him, you can gaze in wonder as Jeff creates the "next best thing" for Delta3D.

## Erik Johnson

Erik is the creator and Technical Director of Delta3D. He graduated from the Embry-Riddle Aeronautical University with a Bachelor of Science in Aviation Computer Science. He served as a key software engineer for Boeing Helicopters in Mesa, Arizona where he helped design and develop real-time graphical simulations for future rotorcraft designs. In 2001, he joined MOVES as a Research Associate and identified the government's need for a low-cost graphical toolkit for creating training applications. He launched what's now known as the Delta3D Game Engine, contributing to the continuously expanding Serious Games community. Erik plays a key role in ensuring the ongoing quality and stability of the project and directing the future viability of Delta3D. If you have any technical questions related to Delta3D, please contact Erik at [rejohnso@nps.edu](mailto:rejohnso@nps.edu).

## Danny McCue

Danny graduated with a Bachelor of Science in Computer Science and a minor in Education from the University of California at Santa Cruz and immediately went to work realizing his dream of developing (*Continued on page 5*)



The Delta3D Team at the MOVES Institute. Pictured here from Left to Right: Eric Heine, Michael Guerrero (in back, red shirt), Michael Day, Perry McDowell (blue polo in back), Erik Johnson, (in front, black polo), "Mr. D" (blue polo in back), Jeff Houde, and Danny McCue.

## MOVES and ADL Collaboration continued from page 1...



multi-national groups from industry, academia, and government who help to define the specifications and standards for the learning industry and then develop tools and content to those standards.

Since its establishment in 1997, ADL has worked with military and government agencies, industry, academia, and professional organizations world-wide to accomplish its mission and realize its vision that learning experiences must be accessible to all online and on demand. ADL's success is directly traceable to its early decision to work with others in a collaborative environment to research, evaluate, and validate specifications and standards that would advance the goals of the education and training communities.

The agreement leverages existing achievements in science and technology that are behind the current modeling and simulation tools. Outcomes of the collaboration are expected to enhance on-demand job performance and decision-aiding strategies in

mobile learning environments.

Designated tasks will initially focus on leveraging the research and evaluation capabilities of NPS to provide data on cutting edge training technologies, as well as investigate technical data standards such as S1000D and the Darwin Information Typing Architecture (DITA). This new partnership will provide ADL and NPS new opportunities to innovate and evaluate from a learning and performance perspective while maintaining their focus on cost-effective, efficient distributed learning products.

Paul Chatelier, CAPT, MSC USN (Ret.), Research Associate Professor at NPS, states that "This collaborative effort between ADL and NPS sets the stage for the next generation of training capabilities for the armed forces by extending the use of modeling, simulation and virtual environment (VE) technology in the DoD. We welcome ADL's guidance in adoption of immersive learning technologies."

## Cinegrid Continued from page 1...

from the Crevice Dwellers exhibit over the network at 400-450 megabits per second per stream viewed simultaneously in San Diego and in Japan. The scientific and interpretive narration was delivered by James Covell, head of Interpretive Programs at the MBA.

The CineGrid event demonstrated not only the use of cutting-edge technology but also "the depth in networking at NPS, factors which can be used to strengthen partnerships with peers and to forge new partnerships around the globe," said Weekley. 4K video is both spatially and temporally higher quality than high definition (HD) video. In fact, dual 4K streams are 18 times as many pixels as HD. At 60 frames per second, images are projected at 2.5 times the rate of film or IMAX movies.

NTT will loan the JVC cameras and equipment to NPS again, so that this aspect of scientific inquiry can be further documented. Many partners and collaborators have expressed interest in the technology: NASA's United Space Alliance, Naval Undersea Warfare Center, NPS Center for Autonomous Vehicle Research,

JIEDDO, and others. With this technology, according to Dr. Donald Brutzman of MOVES, "NPS is institutionally positioned for maximum impact in remote sensing, telepresence, image analysis and cutting-edge optical network applications."

For more information about this project, please contact Jeff Weekley, [jweekle@nps.edu](mailto:jweekle@nps.edu).



## Delta3D Download Continued from page 4...

commercial video games professionally. Danny quickly gained technical expertise on the Nintendo DS platform and worked as the lead network programmer on multiple completed titles at Santa Cruz Games, serving in the role of Wireless Communications Czar. He now applies his skills toward developing his favorite open-source gaming and simulation engine Delta3D here at MOVES. He is currently rewriting networking code to provide for a robust architecture that can scale to 200+ players in a single game.

**Perry McDowell**

As the Executive Director of Delta3D, Perry leads efforts to evangelize Delta3D and provides premier training solutions for global organizations. In addition, he guides the design work for the various applications that the Delta3D team creates. Perry holds a Bachelor of Science in Naval Architecture from the Naval Academy and a Masters of Science in Computer Science from NPS. He served as a surface nuke officer in the Navy and did sea tours

in VIRGINIA (CGN-38) as DCA, ELROD (FFG-55) as Operations Officer, and ENTERPRISE (CVN-65) as Reactor Controls Assistant and MPA. He is currently a MOVES PhD student and a SMART Scholar. If you have any questions about how Delta3D can help you, contact Perry at [mcdowell@nps.edu](mailto:mcdowell@nps.edu).



Additional information about Delta3D can be found on the website [www.delta3d.org](http://www.delta3d.org) or via email at [info@delta3d.org](mailto:info@delta3d.org). If you want to learn about serious games, visit the office, or explore potential theses, the Delta3D team is located in WA-211, just across the breezeway from the main MOVES area. See you next month for a peek at some of the exciting new features in Delta3D!

**Join Us!**  
**July 13-15th**

# MOVES 10th Annual Research & Education Summit

**Join Us!**  
**Monterey, CA**

## July 13-15, 2010

**Keynote Speaker:**

**Simon Bradley**

*Vice President, Technical Capability Centre 5 – Simulation, IT & Systems Engineering  
EADS innovation Works*

Presentations  
Breakout Sessions  
Research Demonstration Night

**Registration:**

Send Holly Hatlo ([hehatlo@nps.edu](mailto:hehatlo@nps.edu)) an email to register for the Research Summit.

**Agenda:**

Please go to the [MOVES website](#) for the tentative agenda for the 10<sup>th</sup> Annual Research and Education Summit.

**Hotel:**

For hotel accommodations, conference attendees are encouraged to make their own reservations. Please see the [Monterey Hotel and Tourist document](#) on our website for a thorough list of local hotels.

**Register Today!**

**Email Holly Hatlo, [hehatlo@nps.edu](mailto:hehatlo@nps.edu), to register for the Research Summit.**



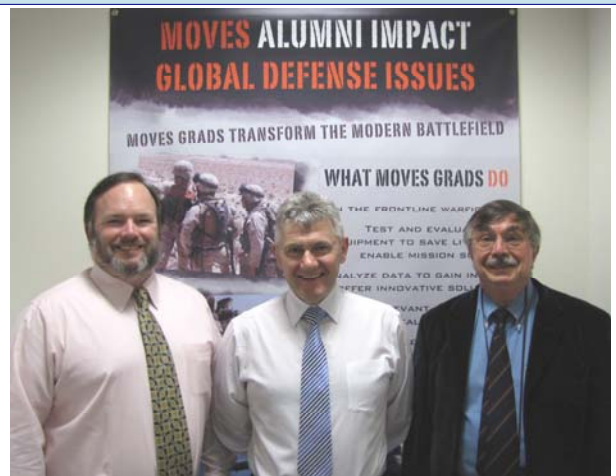
## EADS Short Course at MOVES: DoD Architectural Framework

An instructor from European Aeronautic Defence (EADS) was at the Naval Postgraduate School to instruct the principal investigators of a multi-million dollar research project in the required system architecture documentation. Tony Bagnall, Head of Operations at EADS Innovation Works, spent the final two weeks of March training Dr. Tony Ciavarelli and Perry McDowell in the use of the DoD Architectural Framework (DODAF) and software to help track various requirements within DODAF. DODAF is a framework which is required for all large-scale DoD systems and assists designers to ensure that all requirements are correctly gathered, documented, and included in the final product.

“EADS has used this approach to improve the effectiveness of our design of system architectures”, says Mr. Bagnall. “We are adapting this with our NPS partners in our research program called ROGUEVIDEO.”

“I’ve never been a big fan of excessive paperwork, but Tony has really showed how this procedure can be beneficial in producing better software,” said Mr. McDowell. “I look forward to using it in ROGUEVIDEO and seeing whether we realize the promised benefits.”

Dr. Ciavarelli and Mr. McDowell are the PI’s at MOVES of a collaborative project with EADS. The project is designed to validate standard operating procedures for interagency collaboration during an emergency event, such as a major natural disaster or terrorist attack.



Tony Bagnall (center), Head of Operations with EADS Innovation Works along with Delta3D Director, Perry McDowell (left), and MOVES Research Professor, Dr. Tony Ciavarelli (right).