

## UNDERSEA WARFARE

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### **OPERATIONS INTEGRATION WORKING GROUP (OIWG) PARTICIPATION**

**Donald Brutzman, Associate Professor**  
**Undersea Warfare Academic Group**  
**Sponsor: Naval Sea Systems Command**

**OBJECTIVE:** The Navy has initiated the advanced tactical build (ATB) project to infuse advanced tactical control technology into submarine combat control subsystems. An ATB consists of tactical decision aids that assist the commanding officer in achieving control of the tactical situation and making timely tactical decisions. The Operations Integration Working Group (OIWG) is part of the tactical control development-working group, and evaluated current work and provides peer reviews of ATB projects. This proposal supports Dr. Brutzman's attendance at monthly meeting of the OIWG at submarine development squadron twelve, Groton, CT. As part of the various OIWG evaluations, he will provide expert advice on information display technology and designs, particularly with respect to interactive 3D graphics and scientific visualization of sonar sensors.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software

**KEYWORDS:** Tactical Control Technology, Submarine Combat Control Subsystems

### **STREAMING 3D GRAPHICS USING VRTP FOR DISTRIBUTED SIMULATION**

**Donald Brutzman, Associate Professor**  
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**Sponsor: Defense Threat Reduction Agency**

**OBJECTIVE:** NPS and George Mason University C3I Center Networking and Simulation Laboratory have been leaders in exploring new technologies for DoD distributed simulation. Both groups have worked in the areas of virtual environments, network protocol support, and multiplatform software tools based on web browsers and JAVA. The key problem in presenting dynamic physics-based simulations using 3D graphics is effectively streaming behaviors among participants. It is particularly challenging to provide consistent, interactive and responsive animations among collaborative partners. The DIS-JAVA-VRML project demonstrated such functionality, and is a preliminary implementation of the Virtual Reality Transfer Protocol (VRTP) streaming stack. Funded work under this proposal will complete the full VRTP streaming implementation. Remote-participant testing and functional compliance with the HIGJ-Level Architecture will be provided by GMU under separate funding from DTRA. Military student involvement and DTRA relevance will be driven by a progressive series of 3D demonstrations that collaboratively visualize high-profile threat-reduction scenarios.

**DoD KEY TECHNOLOGY AREAS:** Computing and Software

**KEYWORDS:** Distributed Simulation, Virtual Environments, 3D