Network Effects Emulation System NE2S / Cyber Emulator

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Abstract — Network Effects Emulation System (NE2S) is a software application to help designers and planners provide battlestaff training in a degraded cyber environment. NE2S simulates a wide range of network and host based effects on end user workstations. This allows exercise designers to balance training requirements for cyber effects without impacting real world operations or specific command and control training objectives during training events. NE2S does not physically degrade networks and includes the ability to restore normal operations within seconds when the effects are turned off.

Introduction

There is a need to provide realistic cyber training at all operational levels. One specific need, and the subject of this paper, is to train Command battlestaffs (Command and Control or better known as C2 units) to operate in a cybercontested environment while using operational networks. NE2S was developed to provide the capability to introduce cyber effects into operator workstations consistent with the requirement not to degrade actual operational network performance and be able to obtain an authority to operate (ATO) required to install the NE2S software on existing networks.

Background

The NE2S software application enables exercise designers, planners and opposing forces (OPFOR) to provide training in a degraded cyber environment using realistic cyber effects. NE2S delivers cyber effects to specific end user work stations. NE2S is part of the Cyber Operational Architecture Training System (COATS).

COATS is an architecture integrating cyber range environments, traditional battlestaff training architectures and operational networks to deliver realistic cyber training during battlestaff exercises. The purpose of this paper is to focus on NE2S which is compliant with COATS. Additional information on COATS can be found in Reference 2.



Fig, 1: COATS Operational View

The NE2S client software can be installed on all exercise workstations or specific workstations, depending on the training objectives. The NE2S client software interacts with individual workstation host and network operating system software to simulate desired cyber effects on individual workstations. The NE2S Master Control Station (MCS) is responsible for initiating the emulated cyber effects on specific workstations. Using a remotely-assessable web interface, the NE2S MCS provides situational awareness and command and control of emulated cyber effects on all workstations. The MCS can be located at the Joint Exercise Control Group or positioned at a distributed site.

A NE2S workstation must maintain communications with the NE2S MCS for cyber effects to be initiated. If communications between the MCS and workstation are not maintained, existing effects will timeout (to include no new effects) and the workstation will operate unaffected by any NE2S effects.

NE2S Effects

The MCS directs cyber effects for each workstation with the NE2S client installed. Representative NE2S client effects are shown in Figure 2.



Fig. 2: NE2S Effects

The planning and integration of cyber objectives into the exercise planning are critical for success. NE2S technology is an enabler for higher fidelity training to include realistic cyber effects but is not a replacement for good exercise planning and command and control activities.

NE2S Lessons Learned

Planning for cyber training is a challenge. Incremental approaches should be used to prevent potentially negative impacts to overall training objectives. The time and effort are needed to integrate cyber vignettes into exercises and must be included in early planning.

NE2S enables opposing forces to improve fidelity of cyber training. However, this technology augments the teams and is not substitute for the teams themselves.

The information assurance certification process is a challenge. The process of obtaining an interim authority to operate through final approval can be a long, cumbersome process. In addition, given approval to operate under one set of conditions does not necessarily equate to full reciprocity for other exercises.

NE2S is a software application developed within the government and is not manpower intensive to operate.



Fig. 3: Battlestaff Training

Conclusion

NE2S, as part of COATS, fills a specific need to simulate realistic cyber effects to training battlestaffs. Exercise designers can balance training requirements for cyber without impacting real world operations or other training objectives. NE2S forces a training audience to fight through various effects consistent with overall exercise objectives. These effects can range from very mild to complete failure of a workstation. However, NE2S does not degrade or damage actual networks and has been granted an interim authority to operate during several major exercises. NE2S is at the last step of approval for a final authority to operate.

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Author Biography

Michael Merritt is the NAVAIR 1.0 Program Management Site Lead and the Deputy Technical Director at the Naval Air Warfare Center Training Systems Division. He is responsible for workload planning, mission execution and collaboration with Government and Industry partners to effectively execute NAWCTSD mission tasking. Mr. Merritt earned a Bachelor's degree in Engineering from the University of Central Florida in 1982. He received his Master's Degree in Electrical Engineering from the Air Force Institute of Technology in 1984.

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