

November spot-light on War College alumni

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The October edition of Military Training Technology magazine featured a question and answer interview with Col. Matthew Clarke, a 2006 U.S. Army War College graduate.

Training Innovators - Q&A

Colonel Matthew Clarke currently serves as the commander of the Sergeant First Class Paul Ray Smith Simulation and Training Technology Center (STTC) in Orlando, Fla., a subordinate organization under the U.S. Army Research Laboratory's Human, Research and Engineering Directorate. He assumed his duties in June 2012, after serving as the assistant to the director – Missile Defense Agency for the European Theater.



Clarke served in numerous program management and contracting positions. Previous assignments include deputy director, Systems Integration and program chief training officer for the Future Combat Systems Program Office; product manager, Individual Weapons within Program Executive Office (PEO) Soldier; and the direct commercial contracting officer for the Defense Security Cooperation Agency. Clarke began his career as an acquisition professional in 1995.

Clarke grew up in an Army family. He was born in Groton, Mass., and lived in numerous locations within the United States, in addition to Europe and Panama. He earned a Bachelor of Science degree in bio-medical engineering at the University of Pennsylvania and holds Master of Science degrees from both the Naval Post Graduate School and the U.S. Army War College.

His decorations include the Bronze Star Medal, the Distinguished Meritorious Service Medal, the Meritorious Service Medal, and other service related awards.

Q: What work is performed at the STTC?

A:The technology center researches, develops and transitions innovative technologies to enhance warfighter training and effectiveness. We

strive for creative, out of the box solutions that not only provide great utility but also are also affordable to get to the largest number of soldiers as possible. To be clear, we are not program managers, we are science and technology researchers and developers. We don't produce systems for fielding. We develop the research and technology building blocks for those systems as part of their initial development or lifecycle improvement.

The goal is to develop technologies that demonstrate great application not only in the training domain but in the tactical or operational, and others as well. We want technologies that can transition to multiple program managers or PEOs. It's also a great plus when we develop technologies that link to and advance other research efforts, achieving complementary research synergy. It's all about training and simulation technology for today and the future—we want to satisfy current warfighter training requirements in addition to those five to 10 years down the road. The emphasis is enduring relevance and utility.

STTC provides an excellent government/contractor workforce combined with a great facility that includes classified work space; we can do quality in-house research. However, we want the best technology to benefit our end-user—soldiers, so we leverage the commercial markets, academia and other government research facilities as a routine practice.

Today, the STTC is actively pursuing research and development in the areas of intelligent tutors, immersive learning environments, human agent teaming, dismounted soldier training, virtual world technologies, mobile applications [apps] and medical simulators and simulations.

Q: If sequestration goes into effect and the Department of Defense's budget is drastically cut, how will that impact the STTC?

A:Every military organization in the research and development business places great emphasis on achieving the most efficient means of executing their programs while continuing to provide quality; the STTC is no different. If sequestration goes into effect it becomes somewhat of a Hobson's choice, only we won't have the leave it option. We are already a very lean organization. A large portion of our funding is customer provided. The key to success in maintaining our customer base is to adhere to the same formula we follow today: provide technology products of enduring value and utility to soldiers and create technology that improves the quality and effectiveness of training.

Q: How important is the STTC's relationship with its sister services, academia and industry to meet your objectives?

A:Establishing strong relationships is a key part of our strategy and our success. The list you referenced represents our customers, our research partners and our technology providers. While an individual research effort may take years to complete, the overall pace of technology change is extremely quick. Networking and teamwork are crucial to learning about new technology possibilities and solving complex problems. So yes, external relationships are very important and we maintain them at several levels.

We have a very close and positive relationship with the Program Executive Office for Simulation, Training and Instrumentation [PEO STRI]. They are our primary technology development and transition partner. PEO STRI is the major conduit to soldiers for our technology capabilities.

We have a long-standing partnership with the University of Central Florida's Institute for Simulation and Training where we do great work in robotics, human robot interaction, dismounted soldier simulation and medical simulation. We also have a strong relationship with the University of Southern California Institute for Creative Technologies [ICT], a U.S. Army-sponsored University Affiliated Research Center. The

ICT brings film and game industry artists together with computer and social scientists to study and develop immersive media for military training, health therapies, and training.

In addition, we are a strong member participant in Team Orlando, a collaborative association of the U.S. Department of Defense and other government agencies, academia and industry, as well as state and local government organizations with the mission to research, develop, test, evaluate, acquire and support simulation and training systems for the armed forces.

Q: What are the top challenges the STTC is facing today?

A:We continuously deal with a long list of challenges on a daily basis—that's the nature of our business. One enduring organizational challenge for us as a science and technology developer is the ability to transition technology into the next phase of the acquisition life cycle, i.e., programs of record. At its best it is complicated and the level of difficulty increases from there. Technology transfer is not a single organization effort. It requires an early and enduring partnership between the developer and the receiver. Like many areas in research and development it is easy to conclude that this is something the government just does not do well. We underestimate the complexities involved. I don't necessarily agree. Often it is a function of resource application. Requirements always outpace resources.

Q: Can you discuss the importance of using intelligent agents in training?

A:Intelligent agents are one of the most critical emerging training technologies; they include virtual humans [VH] and adaptive computer-based tutoring systems [CBTS]. Both VH and CBTS are essential in supporting learning as required by the Army Learning Model [ALM], but have the added bonus of reducing human resources needed to conduct training by taking the place of human role-players and instructors during self-development and other training.

The ALM describes a learner-centric career long process that meshes self-development with institutional instruction and operational experience. For the self-development process, soldiers interact with CBTS intelligent agents that fill the gap traditionally occupied by human instructors in institutional training. VHs act as friendlies, adversaries and neutral role-players and are a primary mechanism to present information and feedback to trainees, test trainee knowledge, and challenge their creativity and adaptability in solving problems. Tutoring agents running in the background assess the progress of the trainee, ensure trainees are sufficiently challenged by assessing their physiological and behavior measures in near real time, and also determine when they have mastered essential concepts so they can move on to the next level.

Currently we are involved in two primary programs of research to enhance the realism and responsiveness of VH, and make CBTS adaptable, easy and affordable to build/modify/support, and responsive to the individual learner's requirements. Two products of this research include the Virtual Human Toolkit [VHT] and the Generalized Intelligent Framework for Tutoring, known as GIFT. Both the VHT and GIFT provide authoring capabilities to lower the entry cost of developing VHs and CBTS. GIFT also provides a developing set of best instructional practices, and templates for integrating sensors, developing domain content and creating/modifying surveys.

Q: How do you see advances in real-time distributed simulation for analysis and experimentation evolving over the next few years?

A: Distributed simulations operating in real time generate extremely large amounts of data traffic. One can easily argue that as simulations become more complex, their associated challenges—data management, the ability to provide services, etc.—increase in complexity as well. We are researching ways to meet these challenges.

Utilizing the capabilities of cloud computing, as is done in the emerging commercial infrastructure, may enable us to eliminate or at least reduce the use of expensive computing facilities. Through the use of virtualization and resource time-sharing, clouds can serve as a single set of physical resources to accommodate analysis and experimentation needs. They have the potential to provide the benefits of economy of scale and, at the same time, become an alternative for scientists to solve challenges through the use of clusters, grids and parallel environments.

However, this concept presents its own set of issues. The systems must be secure while at the same time allow large numbers of participants from virtually any location. In addition, the efficiency of the management of the data sent and received is critical to ensure acceptable levels of service. Finally, preservation of the “real-time” facade to maintain the coherence of the simulation is critical.

In addition to cloud computing, the simulation community is moving to leverage multiprocessor systems as well as adopting the new general-purpose programming of graphics processors. The proliferation of virtualization and cloud based approaches to software services will allow for an exponential expansion of capability.

Q: How is the STTC working to improve advanced distributed simulation?

A:The STTC has a long history of pushing the limits of science and technology in the area of advanced simulation. Distributed simulation is one part of our diverse research portfolio. Continuously improving existing models and simulations to interoperate towards an end—analysis, experimentation, testing, training, etc.—is a requirement that will not go away.

In turn, we are focusing research into how we can better provide interfaces to complex simulations. Our goal is an interface that is intuitive to a diverse set of users while providing a robust methodology for turning models and simulations into configurable building blocks. This is linked to our research in “cloud” and virtualization technologies, systems engineering and human systems integration. The concept is to understand the functionalities required by our users, then develop those models and simulations and their associated interfaces that perform those functions.

While we have an eye on existing architectures, we are also researching methodologies for the future of simulation. We are pushing the limits of next generation architectures for modeling and simulation. There have been many advances in computer science in recent history, such as hybrid computing architectures [CPUs/GPUs], self-forming systems, etc., that we are bringing into the simulation domain. The goal will be to determine where simulation can go in the future and then work with our user community to achieve that future.

The Army is moving training toward a concept they are calling the ALM for 2015. To facilitate this, we are researching methods to develop and assess an integrated, technology-enabled learning environment as well as prototype training materials to provide integrated training support across multiple platforms, e.g., personal computer, mobile device, virtual worlds, etc. Sometimes it is a function of applying the technology from other research areas, such as data-driven systems, to the training domain in novel ways.

For instance, our sister divisions in our higher headquarters at HRED do fantastic research into the human dimension. We leveraged some of this work over the years. In partnership with other elements of HRED, we are researching a distributed soldier representation that will provide a soldier-focused service-oriented distributed modeling and simulation architecture supporting the development and evaluation of large scale distributed system of systems applications.

Q: How does the STTC determine what to research?

A:We are constantly exploring, researching and attempting to create new training technologies that satisfy today's requirements and maintain their value over time. Our funding, the color of our money, allows us to work basic, applied and advanced technology development research. We work projects with the Defense Advanced Research Projects Agency as well as working with program managers, and in some instances directly with an operational unit. The challenge is to find the right balance within that research spectrum as we determine our future investments.

STTC has a very educated and knowledgeable workforce with years of experience. In terms of early research, they have an excellent view on what areas of research we should pursue in a specific technology. They understand where research in a specific area is going or not. We also have a great relationship with our Training and Doctrine Command [TRADOC] and acquisition partners who clearly understand the needs of the Army and their current programs. Bringing these groups together sets the conditions to really synchronize the requirements of the day and the art of the possible. Without a doubt, collaboration is a predominate driver in our decision making process. We meet formally with our partners several times a year to discuss near and far future efforts. We collaborate informally even more.

Our collaboration efforts do not focus solely on future efforts. We also constantly review our current works searching for those specific technology efforts that are not just demonstrating success but are truly ground-breaking and potentially cross domain contributors.

Q: Is there anything new on the horizon at the STTC that is planned to be implemented in the near future?

A:We have a lot of great research and technology efforts in the works. But, in this case, I want to highlight just a couple of things we are doing on the medical and immersive sides. The quality of the medical training research and associated technologies at the STTC is outstanding and significantly improving the standard for medical training in the Army. The STTC continues to research the development of synthetic tissue as a way to reduce the reliance on live tissue for training and the creation of wounds that accurately depict battlefield injuries right down to the feel and smell.

Our medical simulation team provides unparalleled research and innovations that really have revolutionized battlefield trauma care and increased warrior survivability. Hemorrhage control is still the single most important lifesaving aspect in battlefield trauma medicine. Over the past few years, the STTC in cooperation with industry developed an award winning prototype system known in the medical community as MATT, short for Multiple Amputee Trauma Trainer. This system consists of two lower amputations with animatronics technology that provides natural limb movement. Human patient simulators or human actors can wear it to support realistic hemorrhage control training. We continuously receive extremely positive feedback from soldiers returning from deployments on this system's ability to prepare them for both the physical and emotional requirements of events involving traumatic medical situations.

In addition to the medical items, STTC is working closely with the TRADOC on a low-cost, government-developed, massively multiplayer online environment called the Enhanced, Dynamic, Geo-Social Environment, or EDGE for short. EDGE can be accessed anywhere in the world through any open internet connection, allowing soldiers to enter the persistent environment that mirrors the real world in avatar form; whether they are at home, work or deployed. Soldiers reach out virtually to train and leverage expertise from other warfighters at different locations around the world, familiarizing themselves with the operational environment, rules of engagement, negotiation, and cultural and interrogation skills.

We are also developing apps for both the iPhone and Android operating systems to include: game-based language training, immersive and interactive equipment sustainment trainers, end-to-end classroom content delivery software, basic training concepts, digital field manuals and live terrain tools.

This question and answer interview came from Military Training Technology's October issue. Please visit <http://www.military-training-technology.com/military-training-technology/> for a complete PDF or digital copy.

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