

War Games and Simulations: An Interview with the U.S. Army's Roger Smith

As stated in the last interview, no exploration of simulations and gaming would be complete without an examination of the work that the military is doing in these areas. That last entry focused on work at the Navy's Postgraduate School so for a different perspective we now turn to the U.S. Army's Program Executive Office for Simulation, Training, & Instrumentation (PEO STRI). This program office is a series of military, government civilian, and contractor teams that jointly develop, acquire, field and sustain simulation, training and testing solutions. We were fortunate to speak with Roger Smith, CTO of PEO STRI, to learn more about the Army's use of gaming and simulation for training.

First a bit about PEO STRI from its website:

Every Soldier who deploys uses some type of simulation to train critical Warfighting skills. Simulations help our Soldiers hone their skills, rehearse their missions and return to their families safely when their missions are complete. PEO STRI responds quickly to critical, emerging requirements with innovative acquisition and technology solutions and puts the power of simulation into the hands of America's Warfighters!

Saulnier: Thanks so much for agreeing to chat with us. How did you come to be involved in simulations and gaming at PEO STRI?

Smith: I started my career creating operations research models around the performance of F-16 aircraft in various Cold War and WWII scenarios. This evolved into interactive training simulations for individual pilots, soldiers, commanders, and their staff. In the late 1990's it became clear that the entertainment game industry was creating some powerful technologies that had potential uses for military training and analysis. So I started teaching a full-day tutorial on military simulation technologies at the Game Developers Conference in an effort to share military techniques with them and to collect their ideas for use in military projects. We ran this tutorial for 5 years before we decided that both sides had been sufficiently cross-pollinated.

When I became the CTO for PEO STRI in 2006, gaming technologies were struggling for acceptance in Army training. So one of the initiatives that I took up was supporting, promoting, and explaining the value that was embedded in these kinds of applications. Today we have largely overcome most of this resistance and PEO STRI is fielding multiple training tools that incorporate game technologies.

Your program's insignia goes so far as to claim that "All But War is Simulation". How important is simulation for military training and the overall transformation of military operations and readiness?

The K-12 school system graduates millions of young people with valuable, but abstract knowledge. Most of them do not graduate with specific mental and physical skills that can be applied to commercial jobs or military jobs. Generally, these skills cannot be taught in a classroom. They require realistic experiences and hands-on practice. That is where a lot of our military training has to pick up the ball. We use a number of different techniques and tools beyond the classroom to teach soldiers to do their jobs.

Training many of these skills is very expensive, dangerous, and sometimes impossible to coordinate. Wargames have been used to train complex military tactics for centuries. Virtual simulators were added to the mix in the 1980's and 1990's as computer technologies became sufficiently advanced. We are always looking for better techniques and technologies to develop specific skills in young soldiers. What everyone calls a "computer game" today is really a very compelling package of leading edge technologies like 3D graphics, well designed user interfaces, physics-based models, human behavior models, networked interactivity, and effective story telling. We want to adapt and use these technologies in the same way that we adapted the computer, graphics, and VR technologies of the 1990's.

The program defines three types of simulation environments:

- **Live simulations -- real people in real environments (e.g. laser tag)**
- **Virtual simulations -- real people in synthetic environments (e.g. flight simulator)**
- **Constructive simulations -- synthetic people in synthetic environments (e.g. most PC games)**

Can you tell us a bit about each type and why certain types might be preferred for specific training goals?

Live simulation is a very physical experience. Soldiers get out on a controlled battlefield, they use their real equipment, and they go through as many real actions as possible. In Live simulation soldiers fly their real helicopters, carry their real rifles, and have to work on the real terrain and in the real weather. This is usually seen as the gold standard in training.

But Live training requires a lot of planning, coordination, and money. Flying a helicopter is an expensive process. Shooting live tank rounds is dangerous. And planning the movement of thousands of soldiers is complicated. Virtual simulation allows us to move some of these activities into a 3D environment with a simulated vehicle. This eliminates most of the danger associated with real weapons and significantly reduces the cost of the training. It is not exactly the same as practicing with the real equipment, but a soldier is allowed to repetitively take actions that are dangerous and prohibited in live training.

Constructive simulation is the use of computerized wargames that represent large areas and large numbers of people and equipment. These constructive simulations have to have enough internal intelligence to be able to partially automate the behavior of hundreds of computer controlled objects. These act as an advanced form of chess board that unit commanders and their staffs can use to rehearse

the movements of thousands of people and vehicles on a simulated map. These focus on good tactics, planning, and timing on the part of commanders who have to orchestrate the war.

Modern 3D computer games sit on the cusp between virtual and constructive. They provide a rich, 3D, almost immersive environment. But the soldier is interacting with the simulation via a desktop computer that is similar to those used for constructive simulation. This kind of tool is very useful for teaching tactics to lower level unit leaders who are walking the streets with their soldiers and need to learn the best methods to approach situations in that environment. They are developing their thinking and planning skills.

Many of us involved with simulations search for proof that the knowledge is transferable to the real world environment. I imagine with your business you might get a better sense of those measures of success since the stakes are so high. Do you have a strong sense of the ability for simulations to be effective training tools given your experience with medical and battle simulations?

Historically we have measured the effectiveness of simulations by comparing the differences in performance that occur when a soldier has the opportunity to learn in a virtual, constructive, or game simulation before attempting the operation in a live simulation. We find that virtual, constructive, and game systems can significantly improve the time it takes a soldier to master a new skill in a live environment.

There has always been a great deal of anecdotal data in which soldiers describe how helpful simulations have been in preparing for live simulation and real combat operations. They provide feedback like, “the real event was exactly like the simulator” or “this was not my first time in the situation, I experienced it many times in the simulator.” This is encouraging, but we also support scientific studies of training effectiveness.

There are several academics conducting studies in our schoolhouses and academies to measure the performance of soldiers who are taught using different combinations of classroom and simulated environments. Dr. Mike Proctor at the University of Central Florida and Dr. Paul Roman at the Canadian Royal Military Academy have done some really interesting work specifically looking at the effects of game-based training systems.

You’ve been a big proponent of adding serious games to the roster of training tools. Military ‘serious games’ such as Virtual Battlespace 2 (VBS2) are now standard. Can you talk about why you feel serious games in particular are an effective addition to your arsenal of training environments?

The evolution of training methods has taught us a lot about what can be trained with different kinds of tools, the cost benefits, and ways to mix different kinds of training to achieve the best results. Games like VBS2 are just the next step in this evolution. The biggest benefit is that these games can be delivered to a soldier on a standard laptop computer. These are low cost, easily distributed devices. PEO

STRI has created and fielded some outstanding virtual simulators, but these can be very expensive, which significantly limits the number that we can purchase. They are also large enough to require special facilities to house them. Games allow us to take a smaller version of this kind of training out of the specialized facilities and give it to each soldier for the cost of a gaming laptop.

As we have learned in the past, virtual training cannot replace live training; it is a supplement which makes the soldier even more proficient. Constructive training adds another tool for developing talented soldiers. Games add a fourth type of simulation to the mix. These give small units a tool that they can manipulate to explore specific scenarios that they are interested in. The soldiers do not learn how to drive a vehicle or fly a helicopter with a game; those skills are developed in other devices. But they can learn to think about and react to a large number of different situations. We are leveraging the products of the game industry in the 21st century in the same way that we leveraged the academic and industrial research into computers and VR in the 1990's.

The new generation of games allows the player to modify and build their own environments. We are giving these kinds of tools to soldiers so they have the power to explore problems that are directly interesting to them. These tools allow soldiers to take a much more active role in designing their own training.

You've cited Kolb's Learning Styles as something games can address. In short, this theory holds that:

- *Concrete Experience* →
- is followed by *Reflection* on that experience →
- is followed by the extracting rules associated with the experience and/or applying known theories to it (*Abstract Conceptualization*) →
- which in turn affects the next occurrence of the experience (*Active Experimentation*) →
- which leads to the next *Concrete Experience*.

Can you talk us through a short example of how a gaming experience might meet these criteria?

Soldiers have used our games as platforms for understanding their missions in more detail. In one instance a unit in Iraq incurred several injuries to soldiers who were trying to apprehend a group that was barricaded inside a building. After the mission they used our AMBUSH simulation, a serious game based on Operation Flashpoint that was originally developed by DARPA, to recreate the building, the vehicles, and the positions of the soldiers during the event. They ran through the mission repeatedly in an attempt to better understand what the enemy was doing inside of the house and how the unit should have responded to this. They took their real world experience into the game so they could reflect on what happened. They significantly improved their understanding of what could have been going on inside the building and developed a number of alternative responses to those actions. They even created a Machinima movie of the mission so they could pass their knowledge on to other units who might face the same situation. The game was a core part of improving their performance and sharing that improvement with others.

With VSB2 you ended up adopting the entire simulation platform. What did that gain for you, and how important in general is it for you to standardize on a platform for any given kind of simulation?

We purchased VBS2 the same way that we would be purchase a COTS software product like Microsoft Office. Bohemia Interactive had to deliver a software package that met all of the requirements for our training programs. This allowed us to do a request for proposal, competition, evaluation, award, and fielding in less than a year. That is incredibly fast for a working product. Within a few months of the purchase of the product we were fielding it to 53 sites around the world.

As a government acquisition organization, PEO STRI is required by law to award contracts and purchase products competitively. VBS2 was selected via a competition and future purchases will go through this same kind of process. We are very eager to establish standards that allow multiple products to work together, but we do not want the standard to be equivalent to one vendor's product. Across multiple competitions there will be many different products selected. The standard that allows these to work together needs to be defined independently of any one product.

You've talked about Simulation-as-a-Service, what you call a "dot.com boom in simulation":

A dot.com boom in simulation would extend our systems through the military Internet to every soldier's desktop computer. It would allow every soldier to browse our offering of simulation services, enter the one of their choice, and join a team to explore a new idea or receive a lesson from a leader. The technologies to do this are available now and pooling at our feet... Simulation as a Service will expand and extend the value of our products to the soldier in the same way that virtual and constructive systems have done in the past.[see T&S journal]

Is this where you hope the evolution of simulations will be directed – less restricted by heavy client-side technologies and more adaptive, configurable, hosted offerings? Do you see evidence of this happening?

We are still getting games under our belts and into our inventories. But as we do that we see the limitations imposed by gaming quality laptops and the need to comply with security constraints on every computer that receives the software. The concept of "Simulation as a Service" is at a stage where games were in 1998. There are a few implementations of this, but most people do not see how this can be valuably applied to training.

Delivering a simulation to any computer as a service is like accessing your email online, or editing your office documents with Google Docs – it removes the constraint of being tied to one specific computer. Potentially, any military computer with a network connection can reach out and pull in a wide variety of simulation-based training materials. These might be in the form of constructive, map-based simulations

or as 3D game environments. But the key is that soldiers will not have to install them on the computer, instead they will just use them while connected to a server where the real heavy lifting is being done. This could turn every computer into an on-demand, custom simulator.

Computer users are just getting acquainted with this idea. We understand using our web browser to read email and to play simple Adobe Flash games. But most people do not understand that the browser, together with modern multi-core computers, and some of the new plug-ins can deliver a very rich interactive experience inside that same browser. There have been a few demonstrations of this kind of capability from Google and game companies. Id Software has released QuakeLive and Garage Games has released InstantAction. Google Docs and Maps also give some understanding of what can be done with interactive data. Big system companies like Sun, IBM, and HP are beginning to deliver tools to support this kind of work. It is just a matter of time before the computer industry has redefined what can be done over the web using server-side computing. The military will leverage and adopt these capabilities as they become more widely available and understood.

PEO STRI is a member of “Team Orlando”, a collective of military, industry, and academic institutions in Central Florida (including, to name a few, the National Center for Simulation, the Air Force Agency for Modeling and Simulation, and the Institute for Simulation and Training at UCF). How important is cross-functional, inter-disciplinary coordination and proximity when developing innovative learning solutions like these?

Relationships with other organizations are essential. We all have different strengths and limitations. Team Orlando is a concept of collaboration and cooperation that leverages the strengths of many organizations toward better simulations, models, training systems, and training experiences.

What do you see as the biggest challenge and the biggest opportunity facing simulation and gaming technology in the years ahead?

The biggest challenges are access and affordability. We come out of a time when the state-of-the-art in computing required that simulators be large dedicated systems residing in specialized facilities. But advances in computers have made it possible to deliver some of these training experiences to the desktop. We are currently challenged to get our customers to understand what is possible with this new technology. We are also faced with very stringent security controls on military IT systems. So we must work with the CIO's to find a way to deliver this kind of content through the IT systems without exposing the system to additional security risks.

These personal simulators are several orders of magnitude less expensive than the large systems we have traditionally built. But they are not free. They require an investment in software, communications, and man power. That means the Army and DoD must invest R&D money in this area, followed by funding for the deployment of these systems. This will happen over the next couple of years.

For more information

- [Overview video](#) of PEO STRI,
http://www.peostri.army.mil/PAO/pressrelease/flash/overview/2008_PEOSTRI_Overview.jsp
- [War Gaming](#) article in *Training & Simulation Journal*,
<http://www.tsjonline.com/story.php?F=3982135>
- [Contact info and publications](#) for Roger Smith, <http://www.peostri.army.mil/CTO/>