Simulation in the 21st Century

Roger Smith
Chief Technology Officer
US Army PEO STRI
roger.smith14@us.army.mil

http://www.peostri.army.mil/CTO

We are well into the 21st century and I think it is time to use the new millennium to think about the big future of simulation and training. We are all so used to thinking about the next bug fix, the next experiment, the next federation, the next customer, that we just don't have the time to think about the Buck Rogers kinds of futures in our industry. We are a very aggressive industry. One that grows and changes all the time. We are very critical of our own successes. And that drives us to tackle bigger problems. But like many other industries we are terrible at cooperating. We don't like to work together toward shared goals. We don't have that unified spirit of the Apollo program that bridges all gaps and overcomes all obstacles. I wish we did because we could take a huge leap forward. Today I want to talk about what that huge leap could look like.

Simulation in the 21st Century

- What does a 21st century simulation look like?
- How is it different?
  - Better models, more accessible, portable, extensible?
  - Simpler to use, but more detailed?
  - Leverage new technology?

We all know what the 20th century simulation looks like. In most cases we are still using the simulation tools that we built in the 1990's, the 1980's, and even the 1970's. Does anyone have a tool they are still using that was created in the 1960's? Those tools were fantastic when they were created and have done a fabulous job of serving us for decades. But they lack the power and the flexibility to get us into "the big future", the future that Hollywood dream up for us if they were making a movie. The future that Robert Heinlein would write about in a book about life with simulation in the 21st century.

What would a true 21st century simulation look like? How would it be different than what we already have? Would the models be better representations of real world phenomena? Would the simulation be more accessible, portable, or extensible? Would it be easy to use in spite of the fact that it was more detailed? How would it leverage new technologies? Which new technologies would be its core supports?

Now those are some interesting questions. Let's look at one possible Big Future for Simulation. Let's start talking about the 21st century for our industry before the 21st century is over.

We have seen a number of different visions of the future in movies.

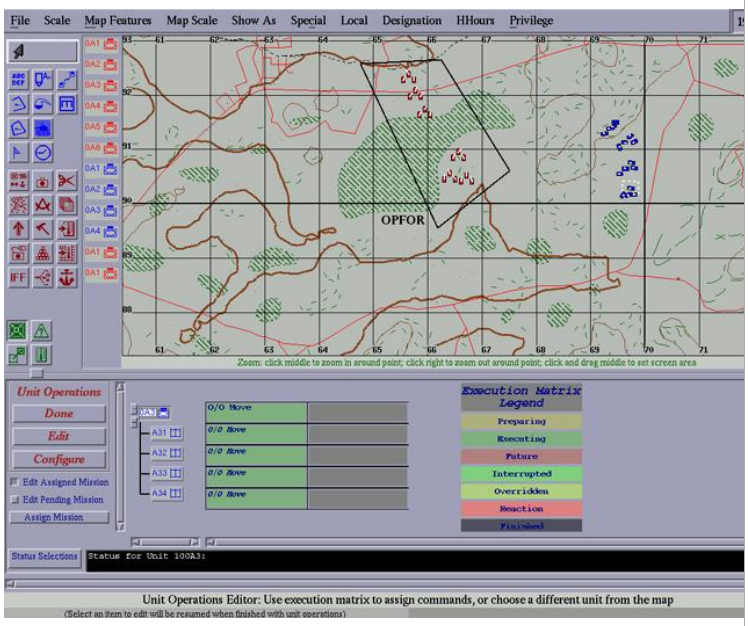
There are those that are Orwellian that talk about how e are all going to be controlled by the big brain on the screen. Society will crush individuality. That does not sound like our industry. Individuality is something that we have in spades.

Some futures are regressive like “The Time Machine” and “Mad max”. They think we are going to destroy ourselves and roll back into the stone age. I have not seen any evidence of that in simulation. Have you? I think this future was really fed by the fear during the Cold War. There might be an economic revision of this driven by the Economic War with China.

Others are conventional like The Jetsons. Society is just like today but with whizzier technology. Everything is faster and cleaner, and we can fly. That one looks similar to what has happened at the end of the 20th century. Our computers are flying by comparison to those we started with in the 1970s and 1980s.

Finally, thee is the utopian society in which all of our problems have been overcome and we are so successful that we can safely send scientific (not military) explorations to other planets. Star Trek is really about the space faring equivalent to Jacque Cousteau. But they do have to get into fights with lasers and photon torpedoes to make an interesting story. This is the big future that we are striving toward. This is the view that I would like to take when talking about simulation in the 21st century. I believe Star Trek happens in the 23rd century. So we might be working toward this for a long time.

Stuck in the QWERTY Swamp



In some ways we have a QWERTY problem. The technology of the past keeps recurring in the products of the future. The QWERTY keyboard was not the best for fast, efficient typing. But it was the one that compensated for the limitations of the machinery when typewriters were new. Similarly, some of the user interfaces that we put on our new simulations just mimic those of the past. They are not necessarily the best we can do, or even appropriate for the new simulations, but we are so familiar with them that we keep repeating them, rather than trying to create something better. All of the old hands in the audience will recognize this GUI and know that we have thrust it onto some of our new systems as well. It was ugly and cumbersome to users in the 1980s and 90s and it is even more so today when they are familiar with so many better interfaces.

But the point of this presentation is not a single user interface, it is about moving on from the 20th century and creating the next century of simulation. The QWERTY problem is just a visible concrete example. There are others all through our simulation systems and our exercise or experimental processes.

The Evolution of Industrial Power

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There was a similar problem during the evolution of industrial from water power to electric power. With water power there is a single source of power and the only way to tap into it is to put a wheel into the flowing water. This wheel generates kinetic energy as it turns this power was then distributed throughout a small mill or factory through a system of wheels, axes, and belts running through the rafters of the factory. These wheels and belts moved the power from the one big wheel to the different machines. Different sized wheels stepped the power up and down as appropriate for each machine. In this way the power from one big water wheel was used to drive lots of smaller machines – lathe, drills, circular saws, scroll workers, etc.

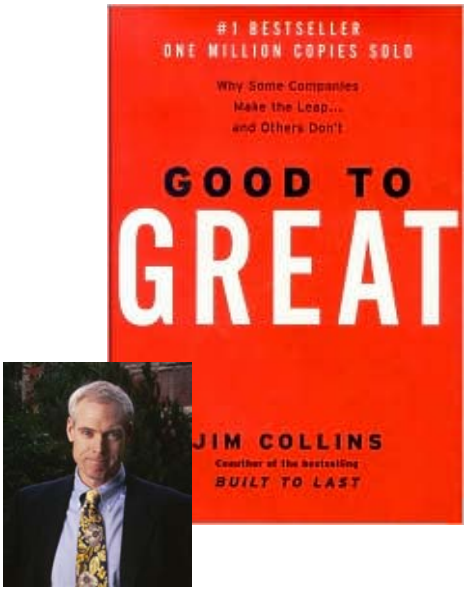
During the 1800s electric power came to these mills and allowed them to generate power without regard to the flow of water. It was possible to significantly step up the amount of power in the mill. With one water wheel, the addition of a new machine reduced the amount of power available to the others. So thee was a balance between the number of tools and the volume f water flow. Electricity would also make it possible to build mills and factories away from flowing water.

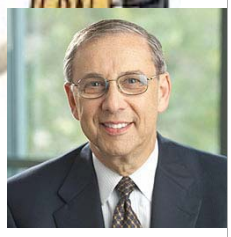
Initially the electricity was connected to one big motor and that motor was connected to the belt system in the rafters. So the system worked exactly like the water wheel. Electricity made it possible to drive some machines faster and to add more machines to the factory, but it did not change anything that happened inside of the factory. It took many decades for people to understand that the electric current could be delivered directly to much smaller motors one each machine. Small hand tools could open independently of the belt system. This made it possible to create tools which were impossible under the water system. It also allowed them to design the layout of the factory, and redesign it, without being limited by the belts in the rafters.

Modern computer technology is bringing capabilities to simulation that allow us to make radical changes to our systems. It is and will allow us to do things that have previously been impossible. But we are just beginning to see how different simulations can really be. We still see these technologies with a “water wheel eye” or a “QWERTY eye”.

Big Hairy Audacious Goal

Good to Great, Jim Collins, 2001





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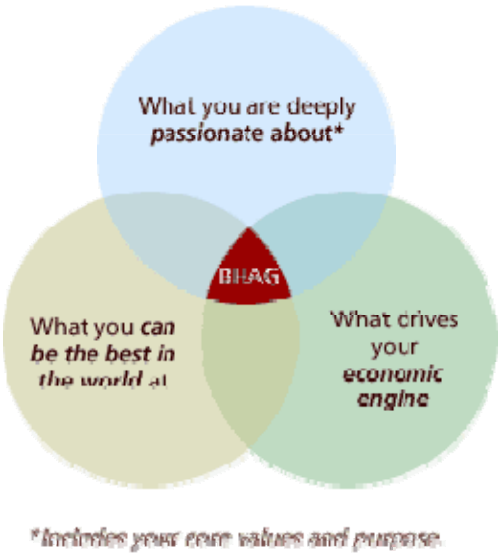
In 2001 Jim Collins published the book Good to Great, which became a huge hit. In that book he introduced the idea of a Big Hairy Audacious Goal, or BHAG. At the time I was working for Ed Bersoff at BTG Inc. and he caught the BHAG bug. We were a medium sized, very healthy, and very ambitious company based in Fairfax, Virginia. (Through acquisition it is now part of L3-com.) Ed started talking about where this company could go. Not 10% growth next year. But, “When will be get to $10B in revenue? How do we structure for that? What are we missing?” I was very impressed and could see clearly the difference between seeing over the next hill and seeing over the horizon. Japanese and Chinese companies are known for setting goals like this – where will we be in 10 years or 100 years. In America we are more action oriented – we set goals that we can take action on immediately. But we still have longer goals – we usually call that “The Vision”. This is an essential part of motivating people to work toward something really rewarding, challenging, and inspiring. Growing 10% per year when everyone else is “only” growing at 8% per year is only exciting to accountants – and to people who have compensation plans that pay-off at 10% but not at 8%. Most employees fall into neither of these categories.

Big Hairy Audacious Goal

- **Criteria of a good BHAG:**
  - Set with understanding, not bravado.
  - Fit squarely in the three circles: Passion, Excellence, Benefits.
  - Have a long time frame: 10 to 30 years.
  - Clear, compelling and easy to grasp.
  - Directly reflect your core values and core purpose.



http://www.jimcollins.com/lab/buildingVision/p3.html

Jim Collins' company describes a BHAG very clearly:

1) "Set with understanding, not bravado" means that it is based on what is really feasible. It is not just a braggart's statement. It is something that everyone can believe is possible.
2) "Fits squarely in the three circles" (of the diagram) says that it is something that the organization is really passionate about, it is something that the organization can really do to excellence, and achieving the goal is part of what drives the economic engine of the org.
3) "Clear, compelling and easy to grasp" says that people have to be able to understand it and find it compelling/motivating. "Achieving 10% growth on EBITDA for 5 consecutive years, while maintaining our position as a leader in widget maintenance." Is neither easy to grasp, nor compelling. Nothing like "putting a man on the moon", "perfectly modeling an infantry soldier", or "eliminating deaths due to bleed-out in combat".
4) "Directly reflect your core values and core purpose" requires that the goal be something that is important to your organization and your people. Achieving it will be more than a moral success, but will improve the financial, market, and future of the company; as well as contributing to the finances, future, and security of the employees.

So what can we BHAG for the simulation industry? The industry is more diverse and difficult to serve than a single company or government office.

21st Century Simulation BHAG

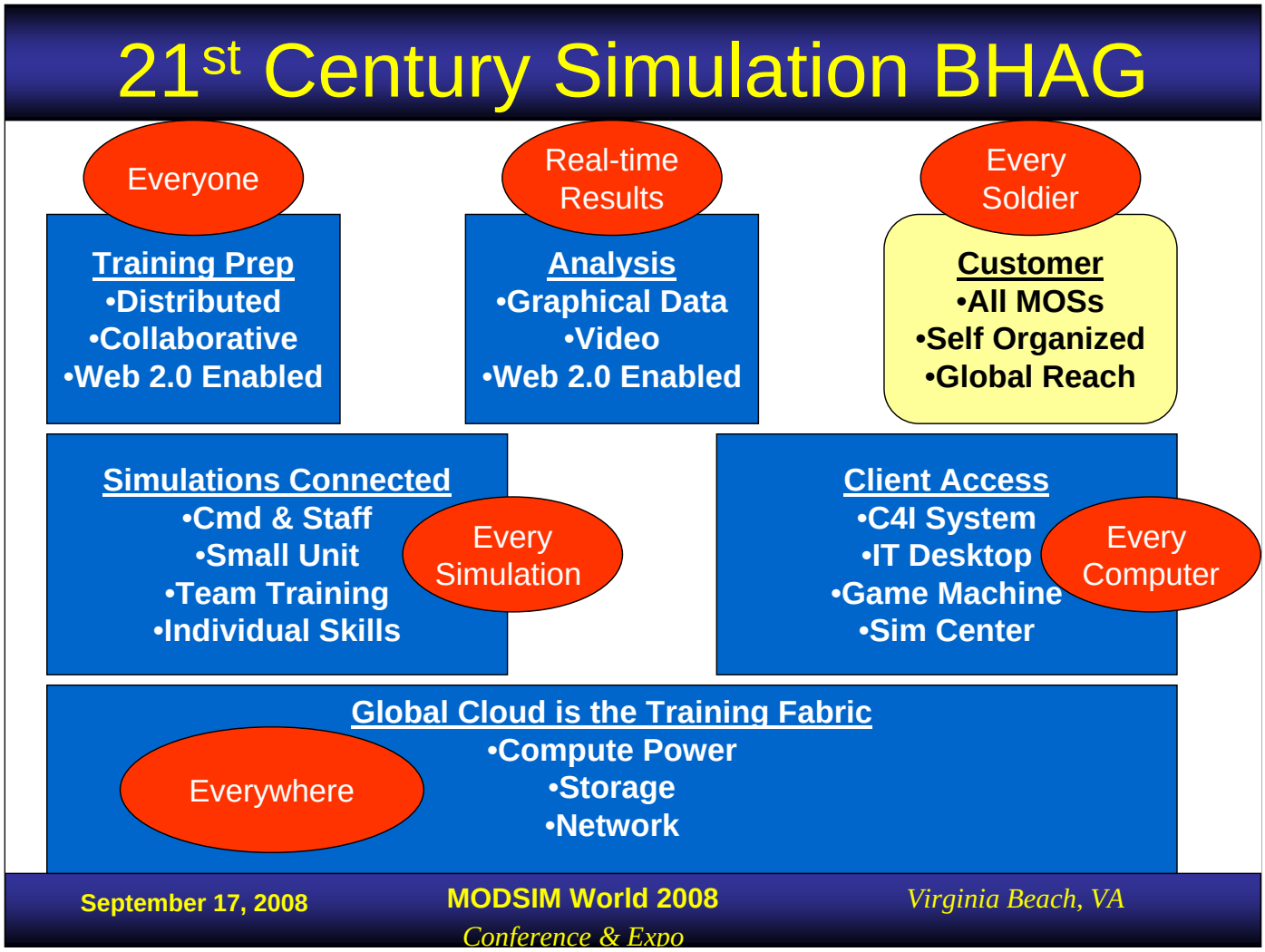
- Training for every soldier, any time, everywhere, using any compute device, connected to every simulation we have.
- Take simulation out of the simulation center. Put it in the cloud.
- Open access to all DoD devices via all DoD networks.

As a BHAG for the simulation industry, particularly that part used for training, I would offer the following. We need to provide access to simulation-based training to every soldier, at any time, everywhere that his mission takes him, and from any computer device that he has available. In these situations he or she should be able to access every simulation that is in the DoD inventory. Coca-Cola measures its success by how many people in the world can purchase a Coke whenever they are thirsty, or when they are preparing to be thirsty, when the idea of thirst crosses their mind. Coca-Cola's success is measured by how accessible their product is to everyone who can afford to purchase one.

Simulation is successful only to the degree that people use it. When we lock the simulation in a "simulation center" or an "experimentation lab" we are crippling our own ability to do what we created the system for – to prepare soldiers to do their jobs better. The simulations have to get out of the simulation center and into a place where people can get to them any time. In today's language we call that "the computing cloud" in reference to computer resources that exist someplace in the world (location does not matter), and are accessible on-demand via the global Internet.

Many of us who work for the military can access our email from portals like AKO from anywhere in the world. Simulation should be just as accessible. Soldiers who need training should be able to open a session from within their business desktop machine or their C4I computer and connect up to a simulation to train. This statement carries with it implications for the way simulations are hosted, databases are created, scenarios are stored, teams are coordinated, and support staff are available. All of this can be done.

To technical people "better simulations" is an important goal. To soldiers "more access to training" is important. Coca-Cola tried to succeed making a "better Coke". Remember New Coke? Customers do not want "better" so much as they want "instant access to Coke".



I am a technical person. I came up through this profession by writing simulation code and building databases with an ASCII editor by hand. Given a BHAG like this, my mind immediately starts to ask, "How can I build that?" Here are some high-level ideas on how to get started on this BHAG.

1) Global Cloud. There is a global computing cloud. It is represented by the networks that join systems together. This is the fabric we need to use for training. Our simulations have to be hosted an systems that are connected to the devices that the soldiers use, not just the local simulation center. DISA has recently made an offer to host services in their cloud and I did not see a list of limitations on this offer. Talk to your local EDS rep about using this service, they have the contract.
2) Simulation on Demand. We currently build a few scenarios that are targeted at specific training events during the year. To make simulation "always on" and ready to run, we need to create scenarios that are on tap all the time along with the simulation that will use it. These services are like web-based computer games in that you can tap into them when you want to play and you can select the mission you want to run. You can also collaborate to pull together your team that will be in the simulation. We don't have to invent these tools or methods, they already exist, we can just copy/modify them.
3) Access. We have to stop building heavy-weight GUIs that require special computers and expert installation. In the IT world, almost all GUI's have moved to web pages. They recognized that their customers cannot be asked to install 100 different programs on their local computers. We need to make simulations where the connection, team building, scenario selection, launching, and performance review can all be done from computers that the soldier has. Predominantly this these are the C4I systems and the IT desktops. Some simulations will require a high powered game machine. Some will require the use of a special cock-pit. But these are the exception, not the rule.
4) Customer Focused. Create systems that reach out to the soldiers, rather than those that are imprisoned in "the sim center". Work to the meet the needs of the customer, not to satisfy the constraints of the developers.
5) Modern Data Preparation. The new wave of Internet applications called "Web 2.0" are all about collaborative access to data. To civilians this is MySpace profiles, LinkedIn networks, Flickr photo albumns, Wikipedia articles, and personal Blogs. These tools can meet the needs of scenario development and exercise preparation. They can bring together distributed contributors who are trying to create data products.
6) Data Analysis. The analysis of all of this data can be done in real-time and deposited on a web-accessible server. It can become immediately created web pages. The first cut at organization and analysis can be automatic just like it is done for stock market data. The second cut can be done with personalized human judgment.

This is a just a start on the idea. But it tries to show the way toward a really big goal, rather than basing our work this year on what we did last year.

Success = Customer Access

Success is measured by how many customers use your products. How widely they can access it. How many unique twists that they find themselves.

We have the smartest people in the simulation world here now. Are we going to talk about tweaking the same old technologies for the same old customers to run the same old events? Or are we going to talk about creating simulation for the 21st century?