PROGRAM EXECUTIVE OFFICE FOR
SIMULATION, TRAINING & INSTRUMENTATION

New Technology for M&S:
Web 2.0, IT Services, HPC, Games

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Notes

Thank you very much for this invitation to return to Seoul and talk about some new technologies that I believe are becoming important in the field of modeling and simulation. In my short presentation we will look at 4 categories of technologies and some specific examples of applications in each of these.

Notes

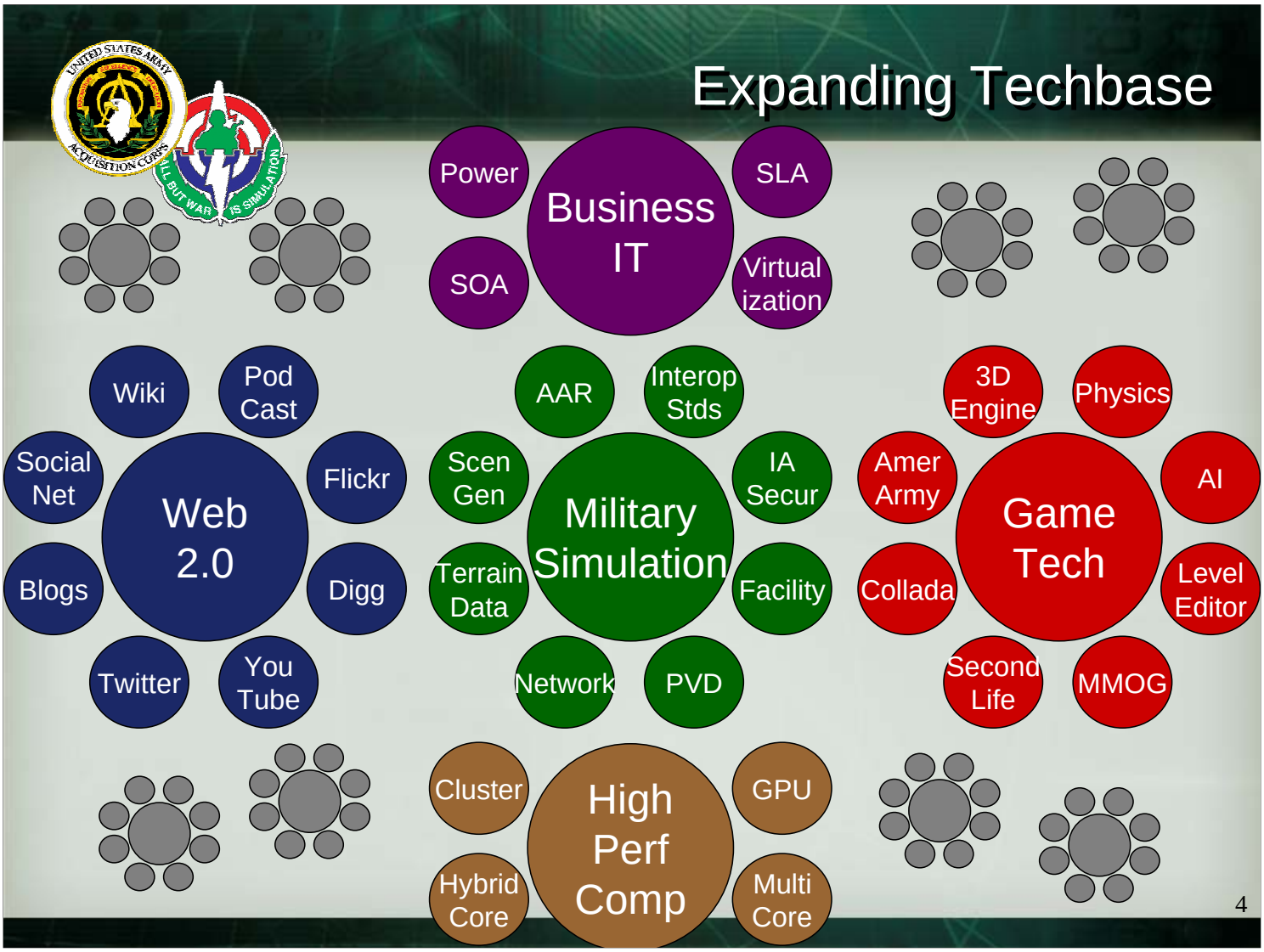
This is not my first trip to South Korea. I began visiting Seoul and some smaller towns in 1992 when I was delivering and operating simulations that were part of the Joint Training Confederation for Ulchi Focus Lens 1992, Team Spirit 1992, UFL 93, and finally UFL 97. During some of these trips I had enough free time to leave the Yong-San Army base and visit the parks, palaces, museums, and churches of Seoul. I enjoyed the walk through Namsan Park to Seoul Tower, the National Folk Museum, the War Museum, Gyeongbok Palace, and Changgyeong Palace. Seoul is a very culturally rich and beautiful city.

[http://www.lifeinkorea.com/travel2/seoul/124/]

Every Serviceman Everywhere

Notes

My role is to identify new technologies that can become an important part of simulations, instrumentation, and training ranges for the US Army, Joint Forces, and our partners like South Korea. In all cases our goals for these technologies are to enable soldiers, sailors, and airmen to practice, learn, and to improve their performance. New technologies allow us to do this better than we have in the past and give us the tools to create learning opportunities that were impossible just a few years ago. One ultimate goal is to allow our servicemen and women to train from anyplace in the world and at any time that they have the opportunity. Some of the technologies that we are discussing today expand training opportunities from traditional bases, ranges, and centers to the barracks, ships, and bases where soldiers live.



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I have been in this business for over 20 years. Like many of you, when I think of modeling and simulation the immediate picture in my head contains pieces like simulation centers, terrain databases, Plan View Displays, security devices, computer networks, scenario generation tools, and after action review systems. These are the components that have matured over the last two decades and make up a large majority of US and Allied training systems. These have given us some amazing capabilities. But they are being complemented by a variety of new tools and techniques that are being developed both inside of the military and outside by commercial companies.

GAME TECHNOLOGY:

Almost everyone is familiar with the use of computer games in military training. This was a new and untrusted idea just a few years ago. But these games carry powerful technologies. They are the computer science of the 21st century. The 3D engines, physics models, artificial intelligence, networking, and persistent worlds that they deliver are capable of delivering training in a way that existing systems cannot. In just a few years our experiments with these tools have identified many ways to offer new forms of training and to supplement our traditional approach to simulation and training.

HIGH PERFORMANCE COMPUTING:

Though games are now well known, the use of High Performance Computers for interactive simulation is just beginning to attract attention. Our friends at US Joint Forces Command have held a number of experiments in which they successfully demonstrated how supercomputers could expand the breadth or the depth of a training scenario. They have activated over one million avatars during a training event. These capabilities are still in their formative stages, but it appears clear that extremely powerful computers can be harnessed for M&S and will not remain the sole domain of nuclear and weather scientists who develop simulations that run in a batch mode for many hours.

BUSINESS IT:

All global businesses have adopted IT as a means of improving their productivity, profits, and expanding their services to customers. In the early phases these products were very specific to business processes like accounting, purchasing, and inventory management. But more recently the Enterprise IT world has begun wrestling with issues with distributed systems, real-time interactions with customers, and dynamic connections between customers and services. The Service Oriented Architecture and Virtualization tools that they are creating can be applied in defense simulation as well. These allow us to create dynamic federations of tools for building scenarios, conducting exercises, and distributing data. Virtualization can enable us to reduce the hardware resources that are currently tied directly to specific applications.

WEB 2.0:

Web 2.0 refers to the new family of tools that allow everyone to create content, pull together collaborative working groups, and distribute the results globally. Wikis, Blogs, Social Networks, and File Sharing services are the kinds of tools that can help us perform exercise planning and scenario generation with distributed teams who do not physically come together. These tools can improve the collaboration that can be achieved and do it at much lower costs.

M&S Technology Opportunities

- Web 2.0
  - Commercial multi-user, collaborative, interoperable services
- Simulation as an IT Service
  - Globally accessible simulation services
- High Performance Computing
  - High volume, reliable compute center
- Game Technology
  - 3D Engine, GUI, Physical Models, AI, Networking, Persistent Worlds

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[Note: This slide provides text to backup the pictures on the previous slide.]

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Web 2.0:

Many of us use these tools in our personal lives to build relationships, share pictures, learn about other people's ideas, and play games. But so far we have largely keep them separated from our working lives. We need to begin looking at these tools and what they have to offer in pre-exercise planning, scenario generation, tests, exercise execution, after action review, and data archiving. There are a number of powerful capabilities that fit the way we do business or that can help us redesign our work to be more efficient.

Web 2.0 Tool Categories

Individual	Ego-centric	*Facebook, MySpace*
	Idea-centric	*Millions of Blogs*
	Interest-centric	*del.icio.us, Digg, StumbleUpon*
	Activity-centric	*Twitter*
Group	Information-centric	*Wikipedia, Intellipedia*
	Delivery-centric	*YouTube, Flickr, Slide*
	Skill-centric	*Open Source, Linux*
	Organization-centric	*Guilds in WoW, Everquest*
World	Geo-centric	*Second Life, Active Worlds, Entropia, There.com*

Notes

Web 2.0 tools seem to fall into a few general categories.

Many are focused on the Individual and allow a person to express their own feeling and thoughts – these are Ego-centric tools. Others are Idea-centric like blogs which allow you to share ideas. Interest-centric tools show what you are personally interested in and make that available to others on the web. Activity-centric tools inform others about what you are doing right now.

Group tools create an electronic space in which the ideas of many people are melded together. Wikis like Wikipedia blend the ideas of many people into a single product. YouTube and Flickr do not create information, instead they are a means of sharing it with others. Open Source Projects allow people with specific programming skills to come together to create a single product. The Guilds in MMOGs allow people to organize into a hierarchy as a means of overcoming the limitations of individual play and conquering tasks that are too big for any one player.

World tools present information in a geographic form, emphasizing the relationships that come from nearness of objects and information. Massively Multiplayer Online Games are a major form of these tools.

Web 2.0 in the Training Lifecycle

Operational Event Lifecycle

Plan	Prepare	Execute	Analyze	Archive
				
•Blogs: Plan & Discuss •Google Docs: Edit & Publish •Second Life: Proto & layout	•Wiki: Build Scenario •Digg: Old Scenarios •Machinima: Create Tutorials	•Facebook: Realtime Collabor •Flickr: Pub Maps & 3D •Americas Army: Combat Environ •Twitter: Realtime Status	•Podcast: Debrief •Wiki: Build & Share Results •Digg: Tag Info •YouTube: Video Distro	•Google Docs •Wiki: Archive •Digg: Tagged

Information Reuse

8

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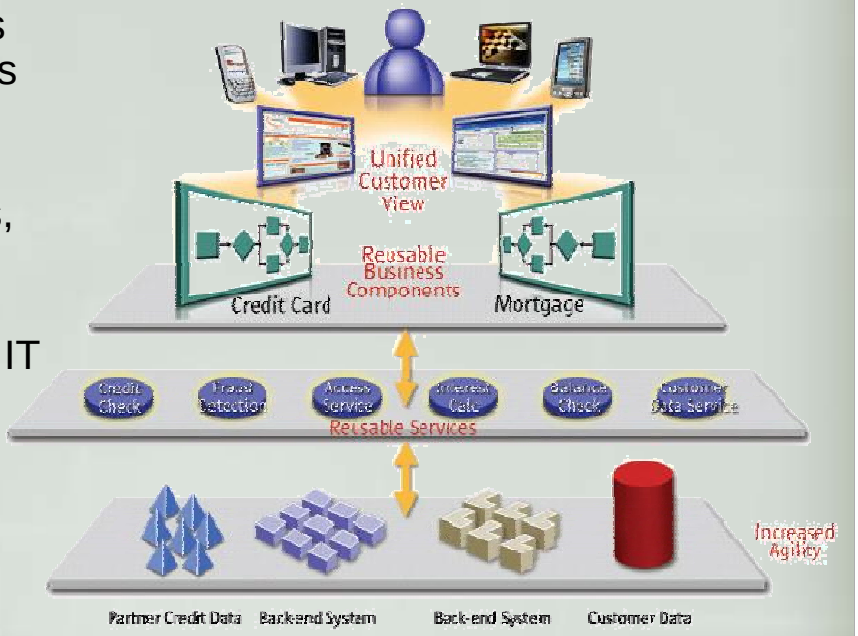
Military Exercises and Experiments are often portrayed as having five distinct phases. Web 2.0 tools can play different roles in each of these phases.

- Wikipedia, Intellipedia – Scenario generation
- Blogs – Planning and AAR
- PodCasts - debriefing
- Facebook, MySpace, LinkedIn, Orkut – Unit collaboration, Planning, Execution interface
- Google Docs – Collaborative docs, planning, admin
- Digg, del.icio.us, Stumble Upon – Indexing, Organize Scenarios, Software and Tool Info
- YouTube – Debriefing, PreEx training
- Machinima – Training Movies
- Flickr, Slide, Picassa – Screen Capture, Event Photos
- Americas Army (esp. multiplayer online features) – Desktop 3D interface
- Second Life, A-SpaceX, possibly WoW because of size – Shared 3D space
- Twitter, Pownce, Jaiku, Kyte – Live system and sensor monitoring

Simulation as an IT Service

- Scalable Simulation Services provided to remote customers on the customers' schedule
- Break the 1-to-1 relationship between equipment, facilities, and events
- Light simulation client as an application on C4I system or IT desktop
- Auto-update of Software and Data
- Evolving Services
- Service Global Customers
  - Units in Country, Homestation, National Guard



[Commercial SOA Diagram]

9

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IT Service Management (ITSM) is a discipline for managing large-scale information technology (IT) systems, philosophically centered on the customer's perspective of IT's contribution to the business. ITSM stands in deliberate contrast to technology-centered approaches to IT management and business interaction. The following represents a characteristic statement from the ITSM literature:

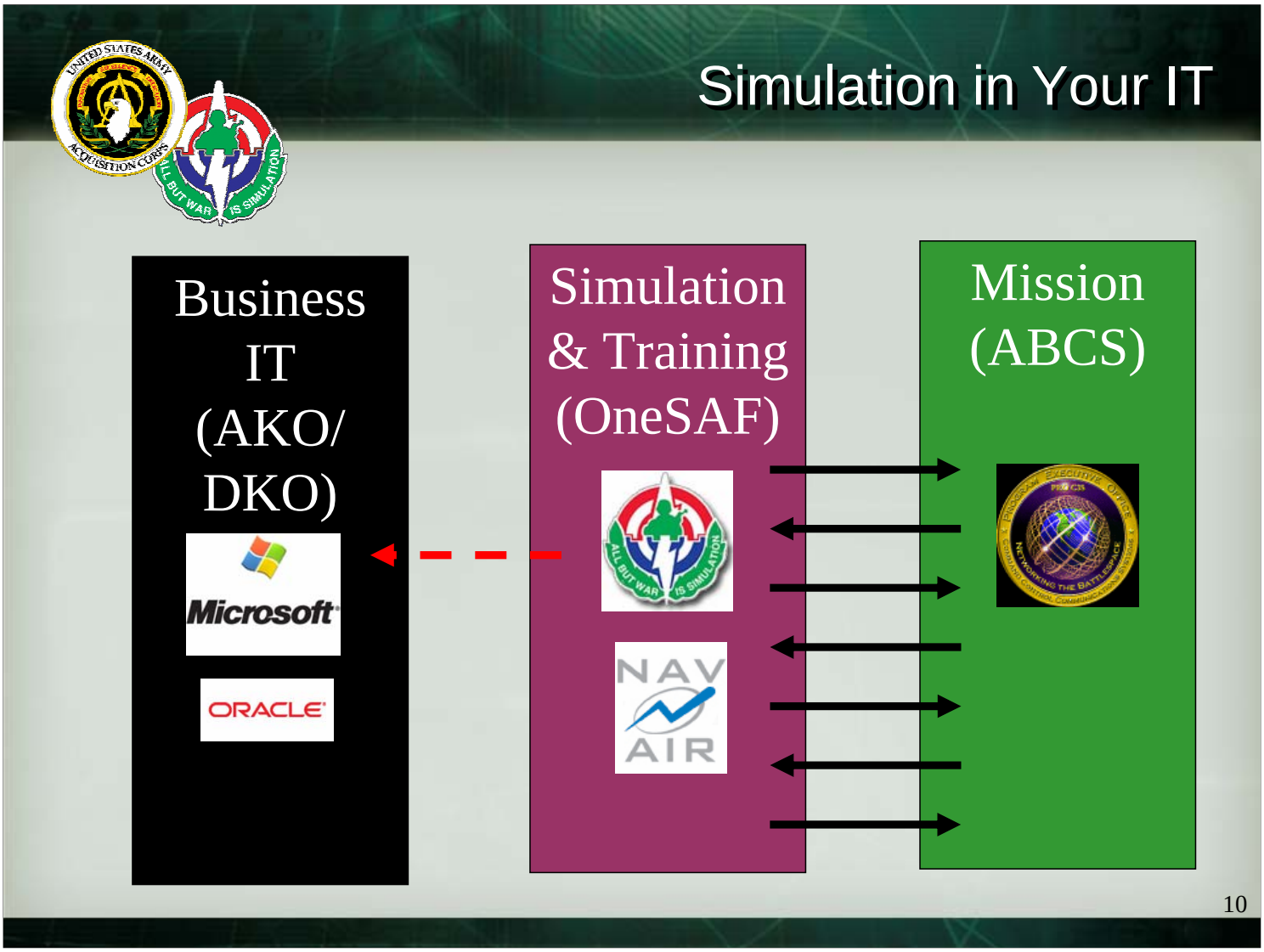
> Providers of IT services can no longer afford to focus on technology and their internal organization, they now have to consider the quality of the services they provide and **focus on the relationship with customers.**

No one author, organization, or vendor owns the term "IT Service Management" and the origins of the phrase are unclear.

ITSM is process-focused and in this sense has ties and common interests with the process improvement movement (e.g. TQM, Six Sigma, Business Process Management, CMMI). The discipline is not concerned with the details of how to use a particular vendor's product, or necessarily with the technical details of the systems under management. Instead, it focuses on providing a framework to structure IT-related activities and the interactions of IT technical personnel with business customers and users.

ITSM is generally concerned with "back office" information technology for enterprises (businesses and organizations), not technology that is a company's primary product. For example, the process of writing computer software for sale, or designing a microprocessor is not the focus of the discipline, but the computer systems used by marketing and business development staff in software and hardware companies would be. Many non-technology companies, such as those in the financial, retail, and travel industries, have significant information technology systems which are not exposed to customers.

In this respect, ITSM can be seen as analogous to an enterprise resource planning (ERP) discipline for IT - although its historical roots in IT operations may limit its applicability across other major IT activities, such as IT portfolio management and software engineering.



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In my career I began linking together simulations and C4I computers in the early 1990's We have been doing this for decades and have a number of relatively mature approaches to this. However, the business IT desktop computer of most soldiers and civilians do not have any form of simulation residing on it. This desktop is really the place where people use tools every day. It is a measure of how important a tool is to the person. But we have yet to put a simulation in the standard set of desktop tools. Where is the simulation equivalent of Microsoft Office or Internet Explorer. We are striving to deliver simulation tools to people where they work every day and allow them to access those tools when they are able to. This would be a huge step forward from simulation center oriented training to customer oriented training. Of course, we still need the simulation centers to host the server-side applications. But the soldier will be able to train on their own schedule much more frequently.

New Simulation Clients

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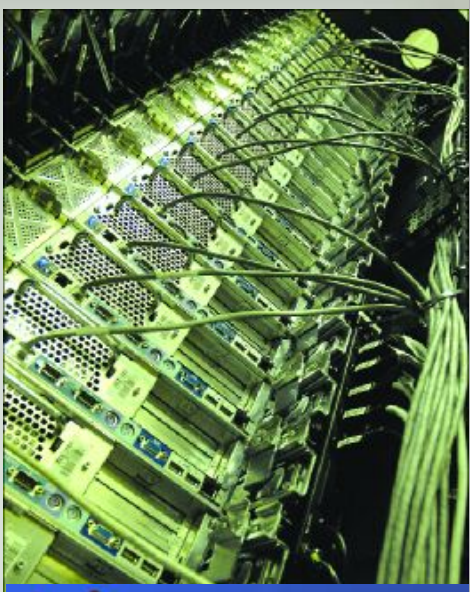
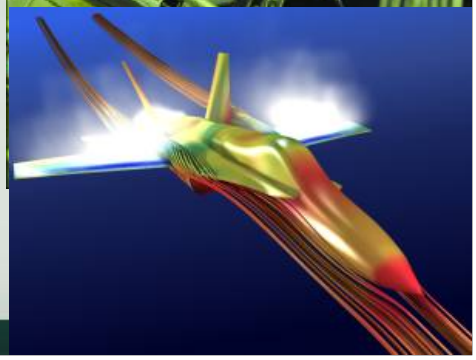
These are five simulations that are built to operate on a client-side desktop. All of these are accessible by an individual and present one small part of the capability required to train a soldier from his own desktop computer.

High Performance Computing

- Large Cluster Machines
  - Support multiple exercises and experiments simultaneously
  - Scale events to represent entire country populations
- Hardware-independent Simulation
  - Instant hot-swap when an error occurs or when load needs to be balanced
- Hardware available to all customers, not just local sim center schedule





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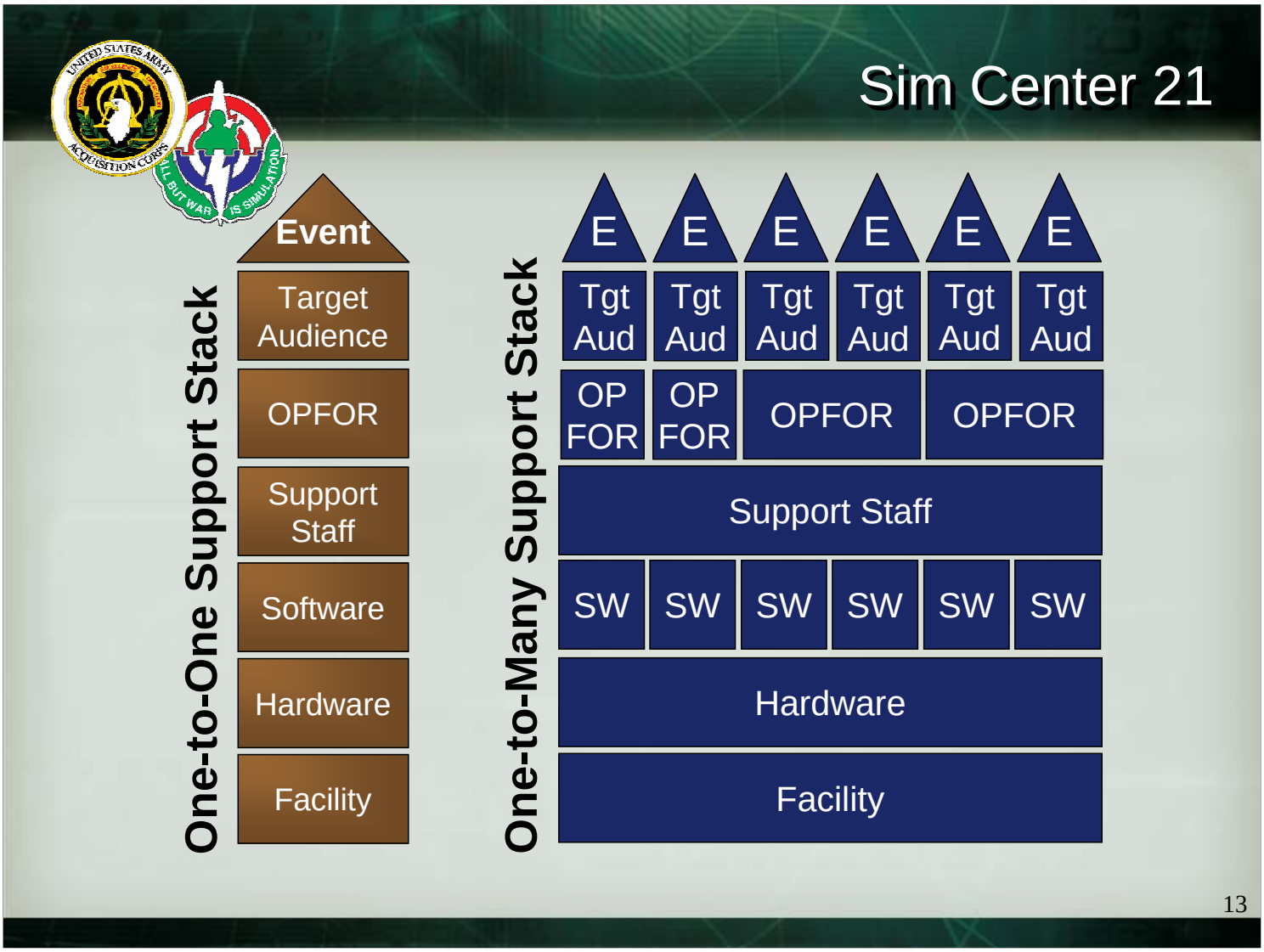
The term **high performance computing** (**HPC**) refers to the use of (parallel) supercomputers and computer clusters, that is, computing systems comprised of multiple (usually mass-produced) processors linked together in a single system with commercially available interconnects. This is in contrast to mainframe computers, which are generally monolithic in nature. While a high level of technical skill is undeniably needed to assemble and use such systems, they can be created from off-the-shelf components. Because of their flexibility, power, and relatively low cost, HPC systems increasingly dominate the world of supercomputing. Usually, computer systems in or above the teraflop-region are counted as HPC-computers.

The term is most commonly associated with computing used for scientific research. A related term, High-performance technical computing (**HPTC**), generally refers to the engineering applications of cluster-based computing (such as computational fluid dynamics and the building and testing of virtual prototypes). Recently, HPC has come to be applied to business uses of cluster-based supercomputers, such as data warehouses, line-of-business (LOB) applications and transaction processing.

The most powerful high performance computers can be found on the Top 500 list at (http://www.top500.org/). The top500 list (which consists of the top 500 most powerful computing systems of any kind in the world, including many which are not HPC systems) is updated twice a year, once in June at the ISC European Supercomputing Conference and again at a US Supercomputing Conference in November.

Many ideas for the new wave of grid computing were originally borrowed from HPC.



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Today our simulation centers are designed so that one facility houses one suite of equipment, which has a dedicated staff of support people, a specific configuration of software to operate a single exercise for a single training audience. HPC will allow us to create simulation service centers that are able to support multiple simultaneous exercises. The hardware and support staff can be shared across multiple events and load-balanced to provide resources when and where they are needed. This is the server-side configuration for both our current model for exercises, and the soldier-centric client-based simulations that we want to deliver to every soldier's desktop.

HPC for Interactive Simulation

- **HPC in its various forms may be an important part of the future of interactive simulation … we intend to find out**

- **HPC offers the power to**
  - Create larger scenarios with higher fidelity
  - Support multiple exercises from a single computer
  - Globally distribute training from a Simulation IT Center
  - Drive innovation in simulation software architecture
  - Coordinate different technologies for different problems:
    - Distributed Processing, Clusters, Shared Memory, Multicore, GPGPU, Cell

Notes

HPCs have not been applied on the production side of military training centers and systems. Joint Forces Command has demonstrated that an expert team of developers can create and operate applications for these computers in support of an experiment. But we are interested in when these computers can become a part of the standard hardware configuration for any simulation center. Supercomputing is evolving in the same way that mainframes were replaced by minicomputers, workstations, and personal computers. The Supercomputer of the past will become the standard future of the present, and the desktop machine of the future.

Leveraging Game Technologies

- Game Technology = 21st Century Computer Technology
  - Games are no longer “toys”.
  - DOD application of games needs to step beyond modifying a product from Best Buy.
  - Extract key game technologies and use those to create military specific systems
- The real value is in the new customers that we can deliver simulations to.

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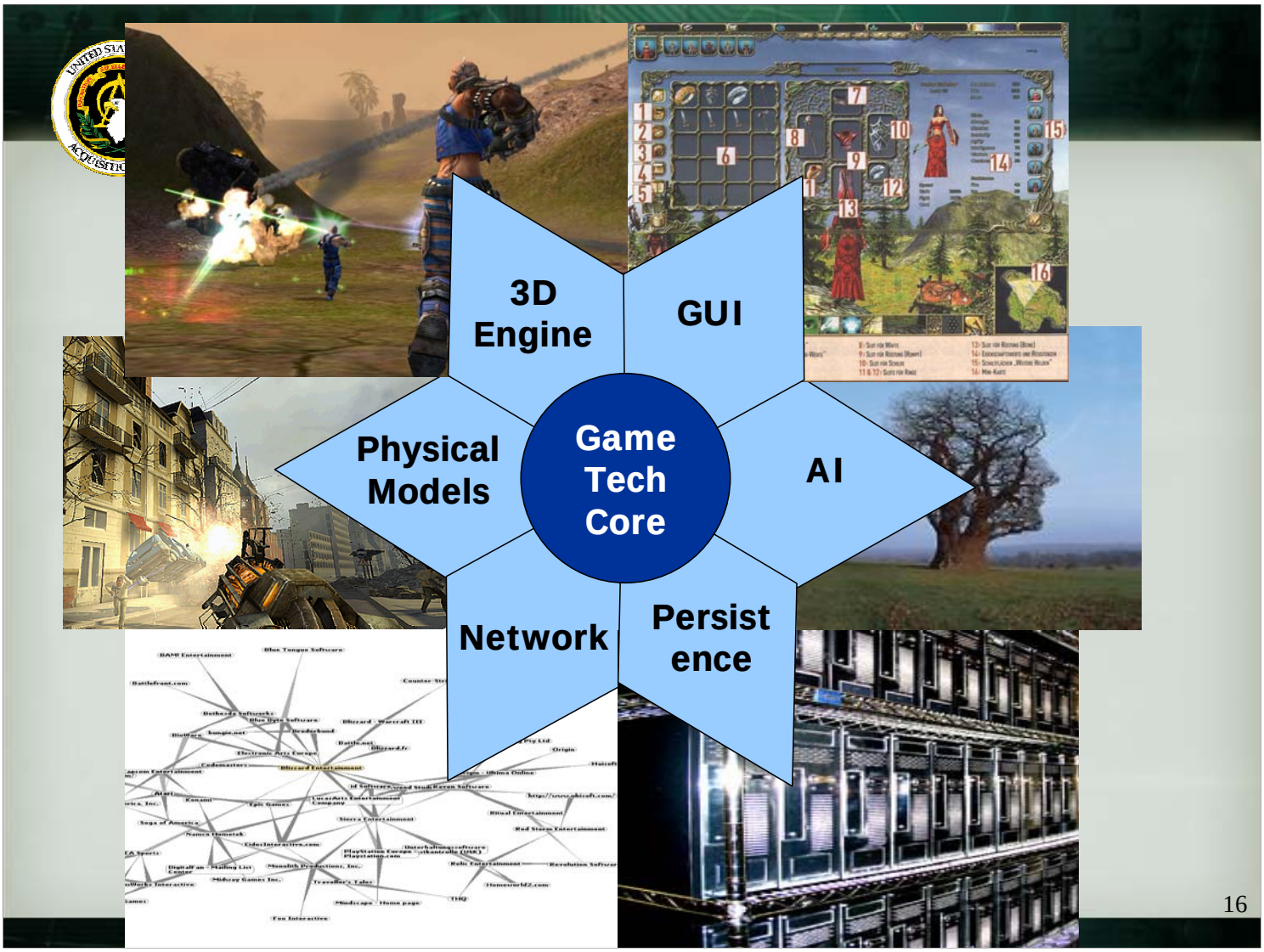

16

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Commercial computer games present a core set of technologies that have value to many industries beyond entertainment, including our own military simulations. The technical core that are can take advantage of include:

•3D Engine – presentation of simulated world

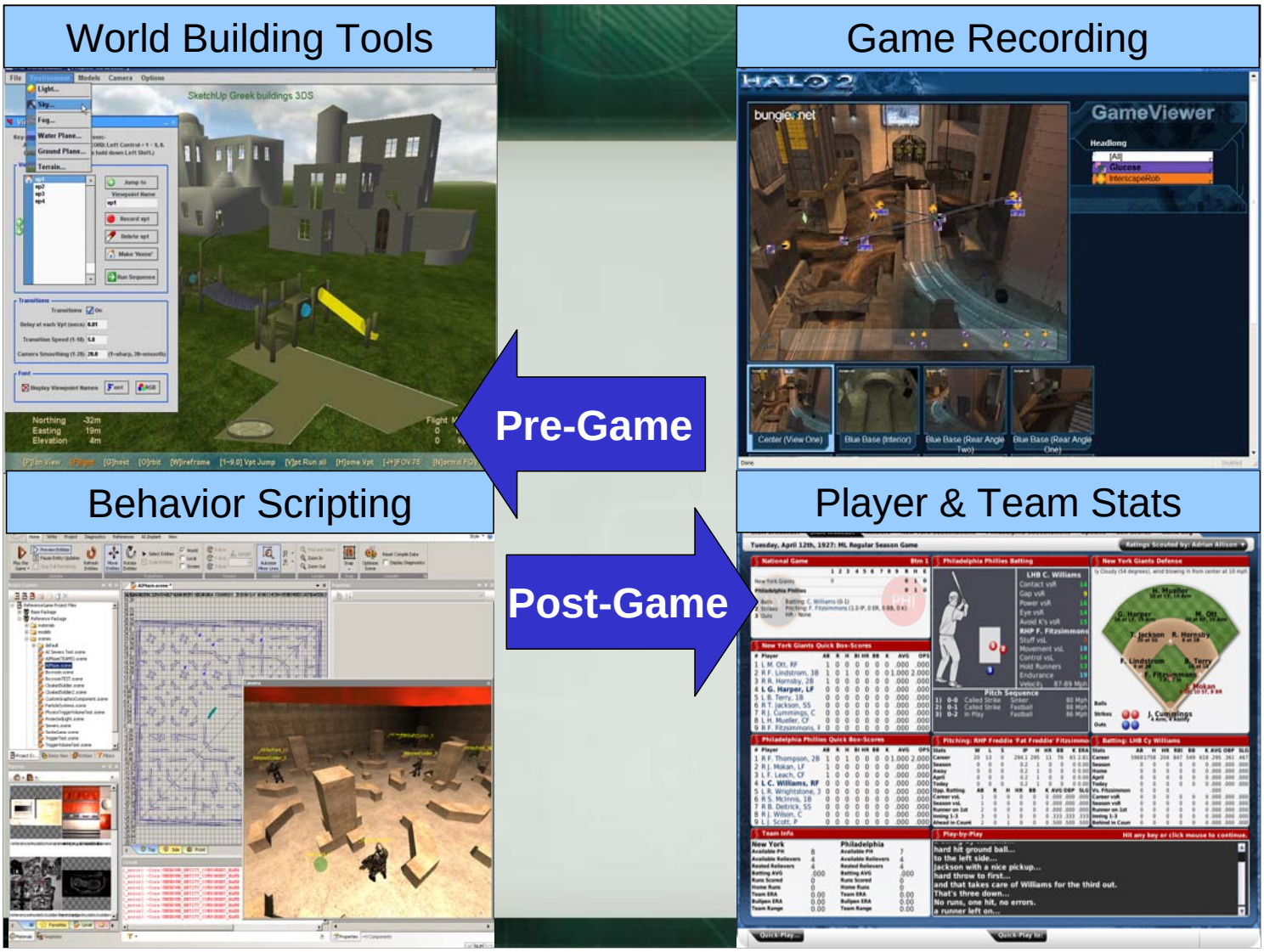
•Graphical User Interface – easy access and manipulation of the system

•Artificial Intelligence – small and compact AI that can fit on a single processor

•Physical Models – Movement, Detection, Communication, Engagement, etc.

•Global Networking – on-demand connectivity among players around the world

•Persistent Worlds – larger context for small unit missions. Also a 3D portal for tactical and intelligence data



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Commercial games are also creating pre-game and post-game tools that are useful for military simulation.

•World Building Tools – user creation of all aspects of a simulation scenario

•Behavior Scripting Languages – user configuration of displays and modifications of characters in the virtual world

•Game Recording – replaying the actions of all players and viewing from any perspective

•Player/Team Statistics – collecting, scoring, and improving the performance of every play and group

…not everyone lives in a castle

"But even here 80% of soldiers have access to a laptop computer and network"
- SFC Richard Colon, US SOCOM, Iraq

18

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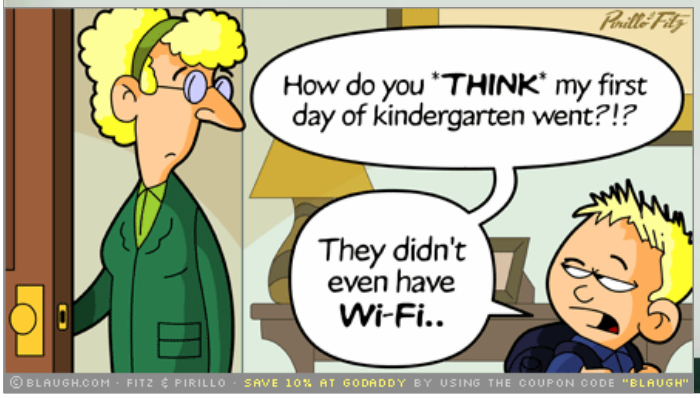
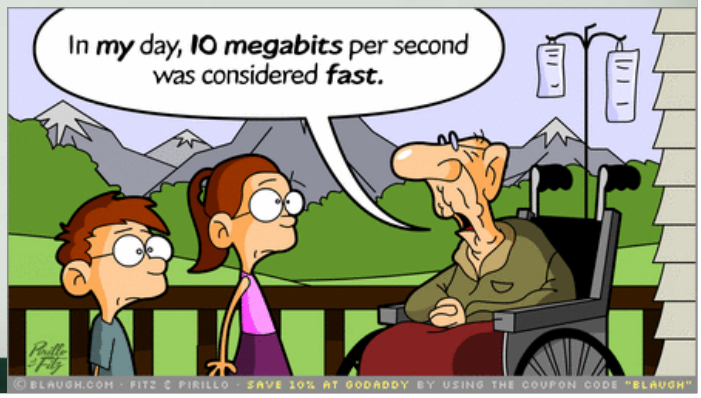
SFC Richard Colon lived in this tent in Iraq for 6 months. But he reports that even in this barren environment 80% of soldiers have access to a computer and a network. These tools may not be as powerful as we need for simulations, but this is an encouraging sign for the future of soldier-centric training with simulations.

Conclusion/Next

- New technology allows rethinking what we have always done
- Commercial industry is equipping the military and the simulation industry to take a new approach to our systems
- Let the generation that understands these technologies include them in new systems designs





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This is an exciting time to be involved in military modeling and simulation. Previous decades offered the computerization of games, networked play, and huge improvements in scale. This decade offers a rich pool of new technologies to carry us to even better training and preparation for our servicemen and women. We need to let the new generation of digital natives carry our field forward in the same way that many of us brought it to where it is today.