PROGRAM EXECUTIVE OFFICE FOR SIMULATION, TRAINING & INSTRUMENTATION

High Performance Computing for Interactive Training Simulation

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Approved for Public Release. Security and OPSEC Review Completed: No Issues.

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HPC Applications

Batch Jobs

- Computational Fluid
 Dynamics
- Computational Chemistry
- > Protein Folding
- Cryptanalysis

Interactive

- > JFCOM Urban Challenge 2004
- Joint SAF
- Tony Cerri & Andy Ceranowitz



Vision for Orlando Simulation Industry

- "The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man."
 - Man and Superman, 1903, George Bernard Shaw
- > Thank You to Some Unreasonable People:
 - Jim Blake & Mike Macedonia, PEO-STRI
 - Randy Shumaker & Brian Goldiez, UCF IST
 - Dave Pratt, SAIC
 - COL Ken Wheeler, PM CONSIM
 - LTC Ray Compton & Troy Dere, RDECOM STTC
 - Andy Mark, HPCMO
 - Dennis Liebold, SGI
 - Mark Fry, IBM & Russ Patten, Mainline Info Sys



Future Simulation Hardware



- > HPC in its various forms may be an important part of the future of simulation ... we intend to find out
- We need the support of our Team Orlando partners

> HPC offers the power to

- Create larger scenarios with higher fidelity
- Drive innovation in simulation software architecture
- Globally distribute training from a Simulation IT Center
- Coordinate different technologies for different problems:
 - Distributed Processing, Clusters, Shared Memory, Multicore, GPGPU, Cell



HPC Example Machine

- > SGI® Altix® 4700
 - System scales to 1024 cores in a single system image
 - Memory address space to over 100TB
- Competitive machines offered by IBM, HP, Sun, and others
- Excellent power and space efficiency

> Typical Single Rack Statistics:

- 64 Dual-Core Itanium-2 (Montecito) processors
 2 sockets per blade
- 128 cores per rack
 - 1.6 GHz
 - 6.4 GFLOPs per core
 - 820 GFLOPs per rack
 - 128-, 256- or 521-GB
 memory per rack typical

- Dual Redundant system disks
- System console port
- DVD / RW
- 10/100 Ethernet (SGI)
- 2 PCI-X slots
- SuSE Linux (SLES 10)
- Intel F90, F77, C, C++, Java
- Multiple storage options



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HPC in the Sim Center

Shared Memory: Big Scenarios

Tight connection between Sims distributed across multiple CPU and memory. E.g. Very large single instance of WARSIM on 128 processors

Cluster: Multi-chunked World

Many Sim instances on individual CPUs with local memory.

E.g. Multiple geographically divided OneSAF instances.

GPU: Vector Operations

Off-loaded vector operations like rendering and LOS.

E.g. Graphic heads for HPC or LOS for sims.

Multi-core: Multi-threaded Software

Every CPU in the machine can support multiple threads.

E.g. Movement, AI, Sensors parsed off to a separate core.













HPC Competition

Suffolk - JFCOM

- UR'04, Wright-Patt, Maui, Joint SAF Federation
- 1,000,000 Simple Entities Active
- Getting their own 256 node HPC (generic cluster)

> Huntsville – MDA, SMDC

- Advanced Research Center
- Hypervelocity Missile Center
- Redstone Technical Test Center

> Orlando – PEO-STRI, RDECOM

- OneSAF Chemical Plumes (SAIC)
- OneSAF LOS on GPU (RDECOM STTC, UNC Chapel Hill, SAIC)
- WARSIM on Multiple Cores (PM CONSIM, Lockheed, Northrop)



Team Orlando

- > PEO-STRI, STTC, & UCF IST HPC
- \$1M Congressional Earmark
- PM CONSIM Support
- Supercomputing 2007 Conference
 Panel
- > ... Bring Your Corporate Expertise Here



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Competitive Summary

Is HPC or specialized computing an important part of the future of Interactive Training Simulation?

➢ If so ...

- Who are the competitors?
- How is Team Orlando positioned to compete?
- What can your organization contribute?
- > Where will HPC-enabled simulation be based?
 - Suffolk, Huntsville, Orlando, DC-area, Leavenworth

