Interactive Training with High Performance Computers

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Objectives

• Leverage the power of HPC as the server farm for interactive simulation for training
  – OneSAF
  – WARSIM
• Multiple simultaneous exercises supported from a single simulation center
• Physics-based object, weather, and terrain modeling (put the “reality” in virtual reality)
• Tighter network connections between applications to eliminate lag
Predecessor Experiments

- Physics-based Environment for Urban Operations
  - HPCMO, STRI, SAIC
- Millennium Challenge Exercise Clutter
  - JFCOM, Maui SCC, Alion
- C4ISR On-the-Move (OTM) program
  - CERDEC, HPTi, SAIC, HPCMO
One Semi-Automated Forces (OneSAF)

- A composable, next generation simulation architecture supporting both Computer Generated Forces (CGF) and SAF operations
- Provides a full range of operations, systems, and control processes (TTP)
- Supports modeling from entity up to brigade level
- Supports DIS, HLA, MSDL, JC3IEDM and USA ABCS interoperability
- Provides variable levels of composability, fidelity and representation
- Supports multiple Army M&S domain (ACR, RDA, TEMO) applications.

- Urban Operations with Contemporary Operating Environment (COE) Focus

- V2.0 Released Feb 2008

Software only

Platform Independent (Linux / Windows)

Software Distribution to:
- RDECs / Battle Labs / Active Duty Brigades & Battalions
- Service / Joint Organizations
- International Partners
- USG / Academia

Capable of replacing US Army legacy entity-based simulations: BBS, OTB / ModSAF, CCTT / AVCATT SAF, Janus (A&T), JCATS MOUT
Team Orlando HPC Server Hardware

Bladecenter Cluster

- 2: chassis
- 12: blades in each chassis
- 8: cores in each blade
- 192: total number of cores

Visualization & Compute Servers

- 4: servers
- 8: cores in each server
- 32: total number of cores

Storage Subsystem

- 27: number of disk drives
- 750: disk capacity in GB
- 20250: total capacity in GB

Management server

- Existing UCF User Network

Gb Ethernet

InfiniBand Switch (Cisco)

- Vis-Compute Server
- Vis-Compute Server
- Vis-Compute Server
- Vis-Compute Server

Storage Node

Management Node

HS21 BladeCenter

DS4300 EXP810
**IBM HS21 Bladecenter Cluster**

<table>
<thead>
<tr>
<th>Installed in Each Blade</th>
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<tbody>
<tr>
<td><strong>Intel Xeon Processor</strong></td>
<td>2 quad-core E5450 (Harpertown) 8 cores @ 3.0 GHz</td>
</tr>
<tr>
<td><strong>L2 Cache</strong></td>
<td>2 X 2 X 6144 KiB</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>8 GB, 667 MHz, DDR2</td>
</tr>
<tr>
<td><strong>Front Side Bus</strong></td>
<td>1333 MT/s</td>
</tr>
<tr>
<td><strong>internal disk</strong></td>
<td>73 GB, 10K RPM SAS</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>80 W</td>
</tr>
<tr>
<td><strong>Ethernet</strong></td>
<td>1 Gb Ethernet</td>
</tr>
<tr>
<td><strong>InfiniBand</strong></td>
<td>Single-port 4X DDR IB PCI-E HCA (Cisco)</td>
</tr>
<tr>
<td><strong>Linux OS</strong></td>
<td>Red Hat V5</td>
</tr>
<tr>
<td><strong>Compilers</strong></td>
<td>GCC Intel Fortran V10.1 Intel C++ V10.1 PGI V7</td>
</tr>
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Orlando HPC: 24 Blades, 192 cores
OneSAF HPC Research Problems

- **Porting**
  - Host OneSAF Sim Core and MCT on HPC

- **Computational Distribution**
  - Efficiency of thread distribution in HPC environment
  - Function of JVM, Node/Process/Core availability

- **MCT Interface**
  - Internal to HPC with VNC video exported
  - External with efficient network comms

- **Light Interface**
  - Operate via light GUI interface outside of HPC (e.g. Aries game interface, Browser interface)

- **Infiniband Network**
  - Multiple instances using Infiniband vs. Ethernet to communicate
Conclusion

• Reduce operational costs for hardware, shipping, set-up time, travel, staffing
• Increase soldier/unit access to training systems
• Increase exercise reliability and availability
• Increase model fidelity
• Increase model synchronization