PROGRAM EXECUTIVE OFFICE FOR
SIMULATION, TRAINING & INSTRUMENTATION

OneSAF and Future Training Technologies

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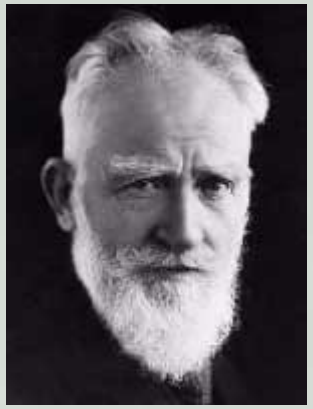
Vision & Innovation

- "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



- "Where there is no vision the people perish."
  - Proverbs 29:18

Two Ideas

- High Performance Computing
  - Future Power
  - SPP, Clusters, Cores, GPU, Cell, FPGA
- Simulation as an IT Service
  - New Structure for Sim Centers
  - One-to-Many Exercise Support
  - On Demand Training
  - Global Reach

High Performance Computing

Shared Memory	Cluster	Multi-Core	Specialized
Multiple CPUs directly access shared memory	Multiple machines tied together with a fast network.	Single Chip with multiple CPUs inside of it. Multiple versions of cache and CPU-specific memory.	Graphic Processing Unit (GPU), Field-Programmable Gate Array (FPGA)
IBM or Cray Supercomputer, SGI Altix	Beowulf, Sun Grid, Rackspace – using Myranet or Infiniband	AMD Athlon 64 X2, Intel Core 2 quad, Sun UltraSPARC, IBM Cell	Nvidia & ATI-based graphics cards, Nvidia Tesla, Xilinx

HPC Example Machine

- **SGI® Altix® 4700**
  - System scales to 1024 cores in a single system image
  - Memory address space to over 100TB
- **Independently add Compute, Memory, I/O, or Specialty Blades**
- **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

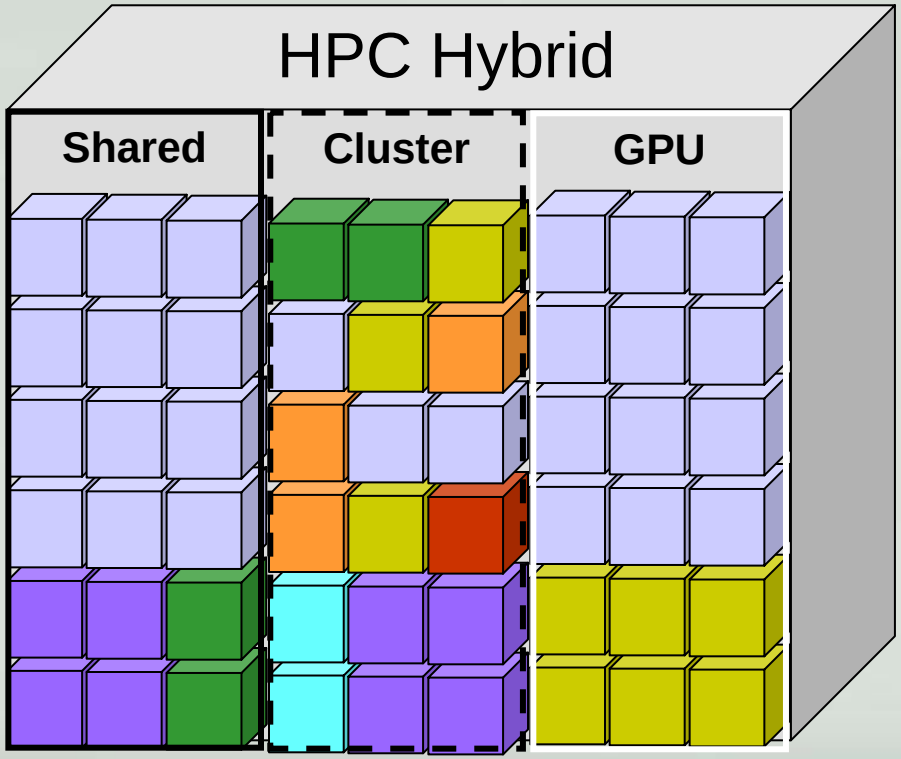
- SuSE Linux (SLES 10)
- Intel F90, F77, C and C++
- Multiple storage options

HPC in the Sim Center

Cluster
Many Sim instances on individual CPUs with local memory.
E.g. Multiple geographically divided OneSAF instances.

GPU
Off-loaded vector operations like rendering and LOS.
E.g. Graphic heads for HPC or LOS for sims.

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



Multi-core
Every CPU in the machine can support multiple threads.
E.g. Movement, AI, Sensors parsed off to a core.

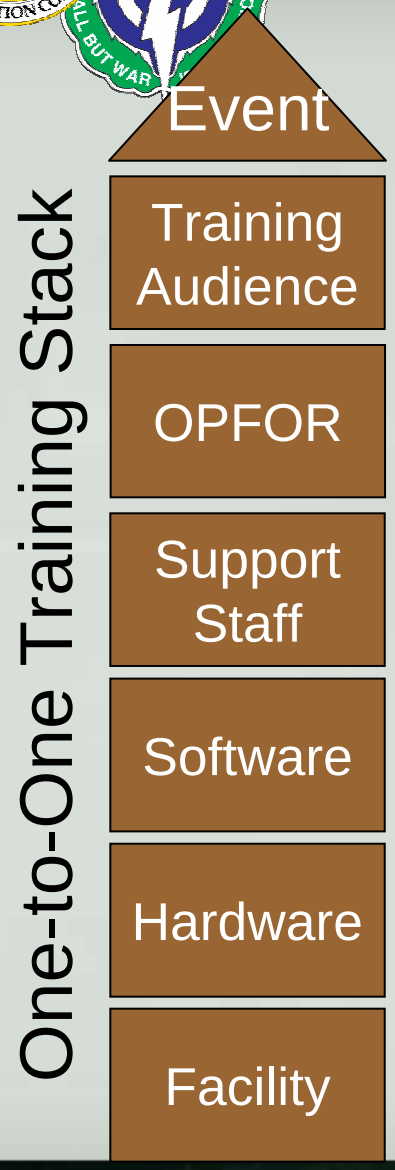
HPC Simulation Experiments

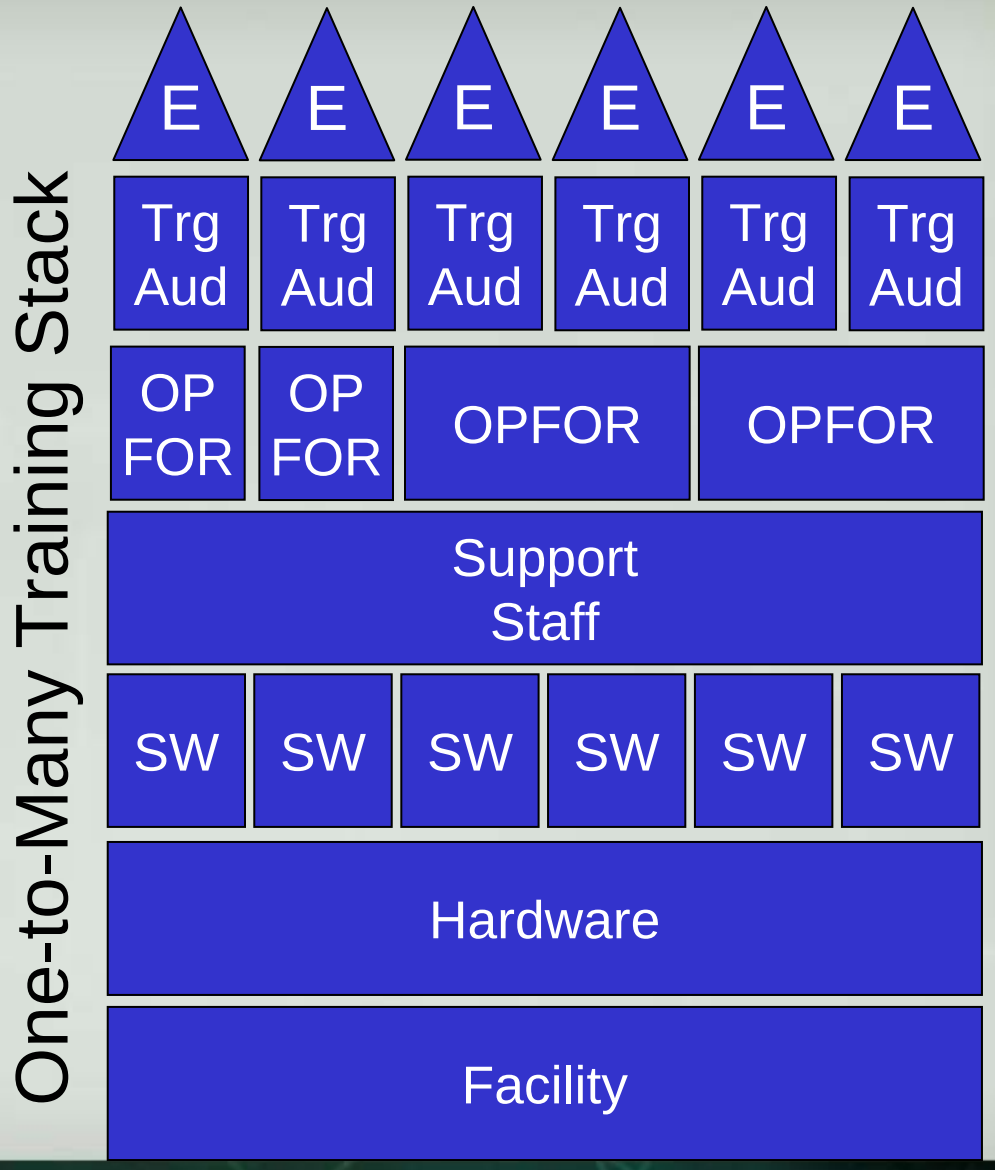
- Experiments and Experience with HPC
  - JFCOM J9 - JSAF
  - Orlando SAIC – OneSAF Cloud Plumes
  - UNC Chapel Hill – OneSAF LOS
  - Huntsville RTTC - OneSAF
- Future Computing
  - Multicore – It is here now. Look for annual doubling of cores.
  - GPU – Useful applications. Limited by graphic card memory.
  - FPGA – Code not specific enough to configure hardware.
  - Cell – Still too early to understand programming model.
  - Physics & AI Chips – Too soon

Simulation as an IT Service: Google Analogy

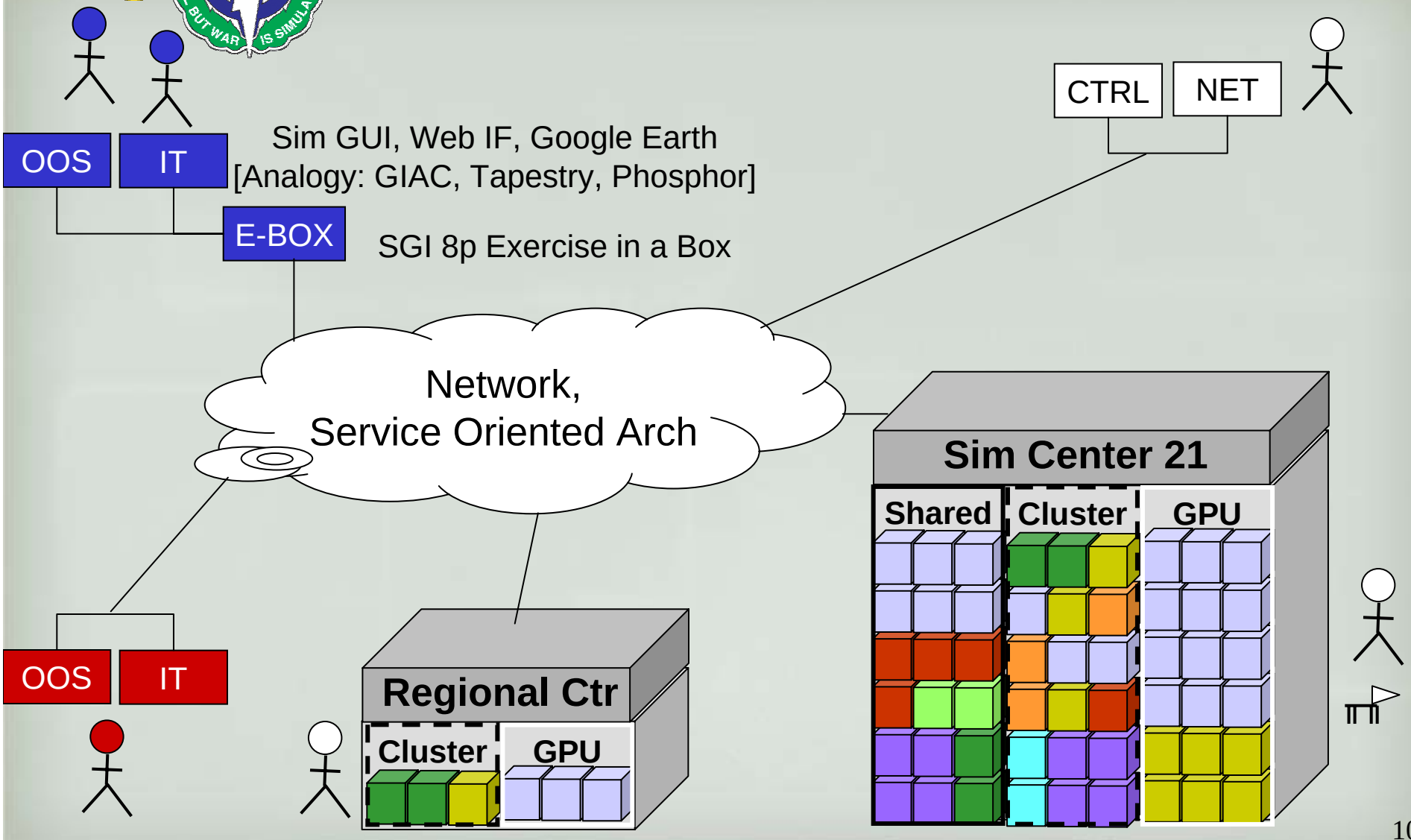
- Personal Google Search
  - Search box installed in my house, dedicated engineer to customize it for my needs
- Google Search Capacity Limits
  - Google has only enough processors to handle 500 simultaneous searches in Orlando. The 501+ search receive a “wait” message.
- Customer-centric IT Services
  - Vendors purchase sufficient resources to meet growing customer needs, automate operations so support staff are not a bottleneck, allocate processing power as necessary when loads change, structure to meet customer demands vs. provider convenience

Sim Center 21





Training to Every Unit



Summary

- 21st century networks and computing systems will allow us to host and deliver training more efficiently than we have in the past
- We will have the potential to reach every unit in the Army around the world
- Must overcome the one-to-one bottleneck to even get close to the potential that is there
- Supporting training to the entire force will take a lot more computing and people than we have now
  - But it cannot take N times more or the Army cannot afford it


GAME TECHNOLOGY
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LASER SENSITIVE MATERIALS
TRAINING SYSTEM EFFICIENCY