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Conference

Parallel Worlds and Beyond:
Using cloud connected supercomputing to create new businesses

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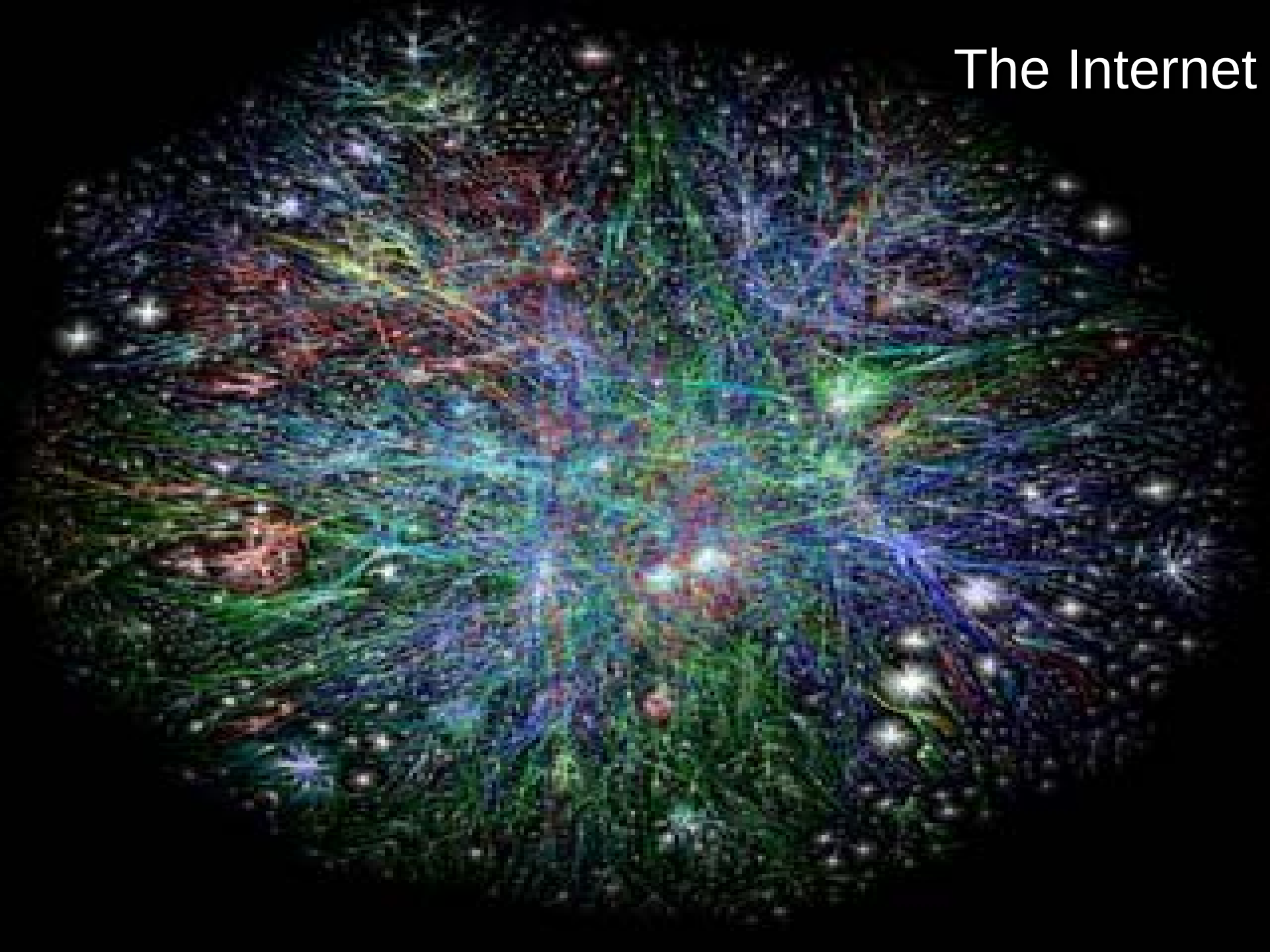
Abstract

Supercomputing has spent most of its life locked into a closed world behind the bars of the batch process. Its use has been largely restricted to computationally intensive jobs with little or no direct user interaction. But 21st century computer and communication technologies have created web-based applications, game-based applications, and now cloud-based applications. These generally use very little compute power for each job, as in a Google search. But if the power of a supercomputer could be released to this near-real-time community of users, what kinds of businesses would embrace access to such a supercomputer?

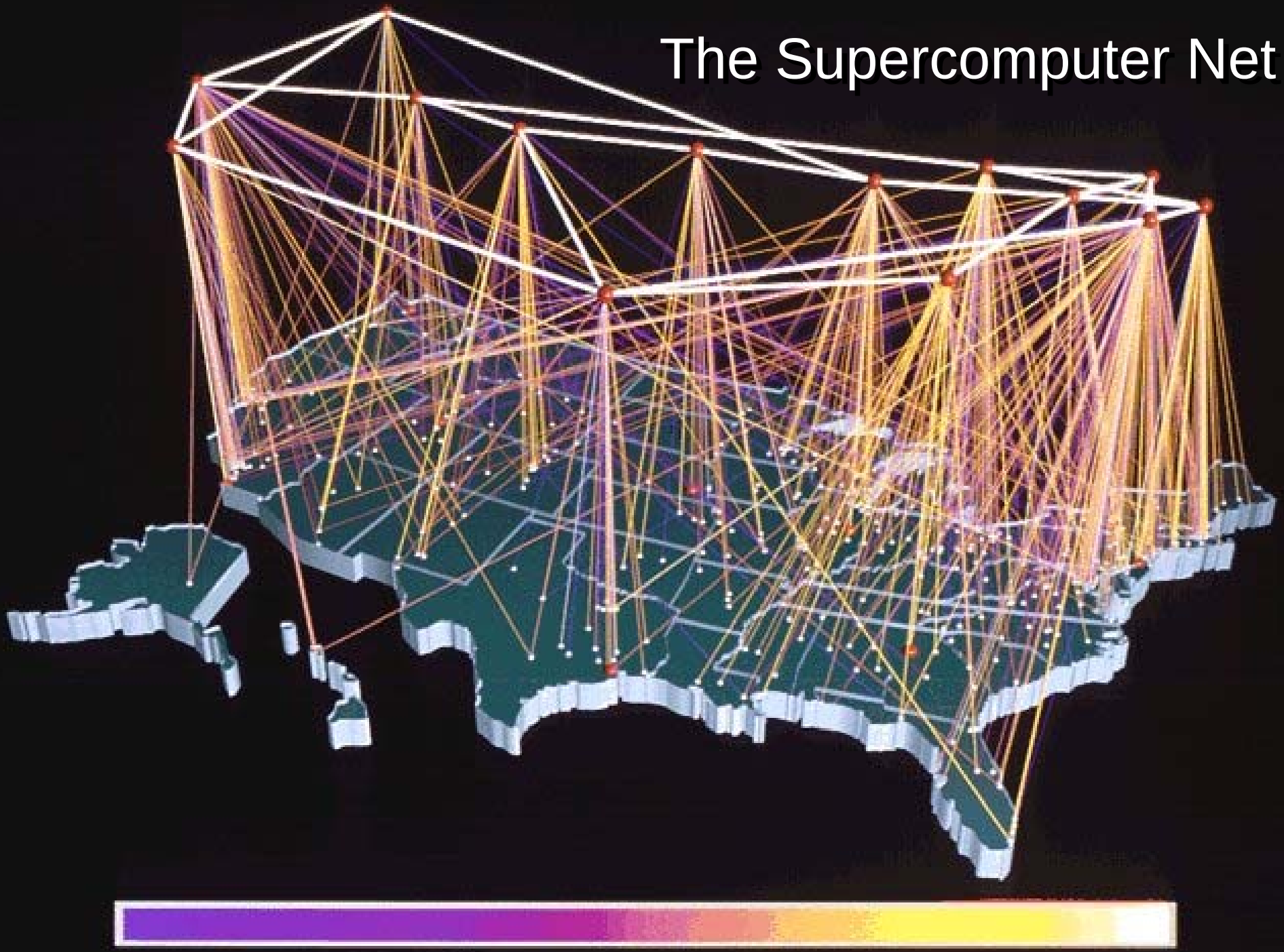
At PEO-STRI we look toward a future in which leadership training is conducted from every desktop computer. We want to release the users from the old bonds to a specially equipped simulation center. We also want to provide them with simulations that have a much richer and realistic synthetic environment. To do this we need simulations that are more computationally intensive and that are structured to interact with users through generic interfaces like the web browser, a virtual world client, or a computer game.

Is military training the only domain that is interested in web-based, real-time, interactive access to large computational resources? Or are there multiple business areas that can benefit from such a structure? This session will present the military training business as an example, but will brainstorm with the audience to identify other businesses that would be interested in this model. Please come prepared to participate in the brainstorming.

The Internet



The Supercomputer Net



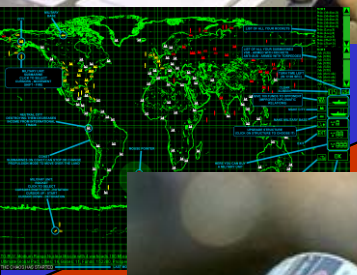

SKYNET
...The Future is Fused...

CONSTRUCTIVE

VIRTUAL

HPC

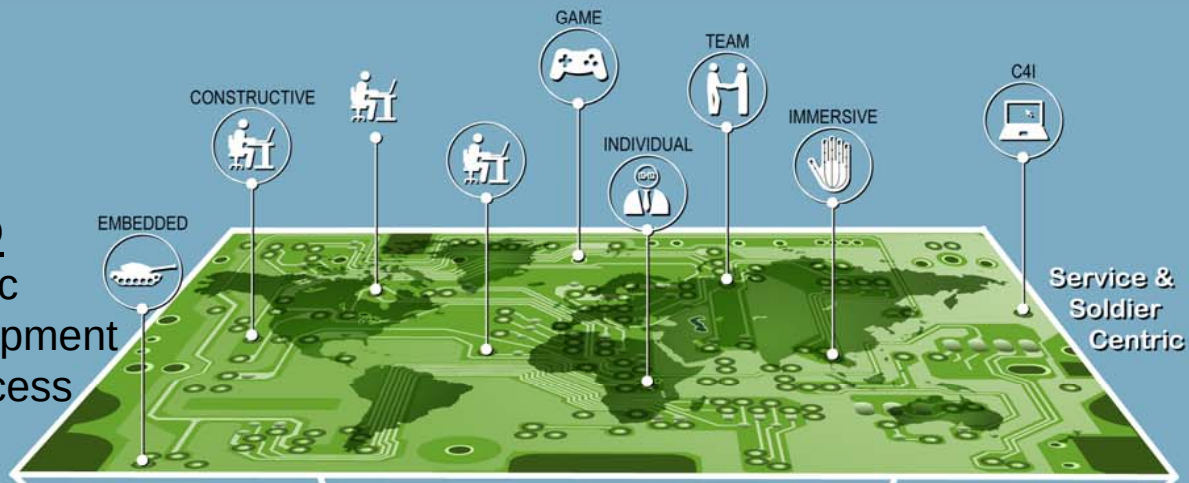
Server-side Virtual World
Compute Power



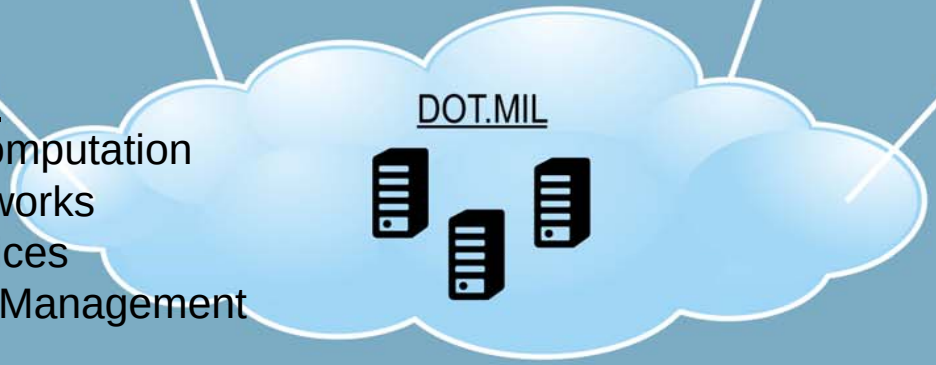
LIVE

Simulation as a Service

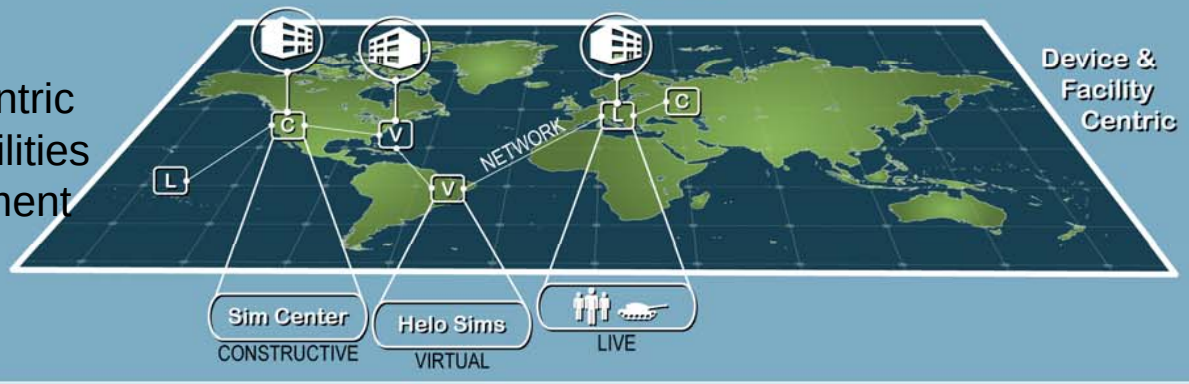
NEW WORLD
- Soldier-centric
- Desktop Equipment
- Universal Access



ENABLERS
- Massive Computation
- Global Networks
- Cloud Services
- Distributed Management



OLD WORLD
- Sim-center Centric
- Dedicated Facilities
- Unique Equipment



Are there markets shaped like this?

Super Computer

+

Global Network Cloud

+

One Million Customers

Application Brainstorm

- If you open the door to the HPC, eliminate the batch jobs, and make the machine responsive to customers on-demand
  - What kind of applications make sense?
- Imagine
  - Amazon Web Services, but for HPC-sized jobs
  - World of Warcraft with physics quality models
  - Global Thermal Nuclear War in high-def
  - 1,000,000 soldiers using wargames

Potential Domains

- Medical – image analysis
- Financial – derivatives, world economy
- Industrial Design – CFD, fluid flow
- Military – wargaming, mission planning
- Intelligence – cryptology, world tracking
- Entertainment – SL with some depth to it
- Cell phones – beyond tip calculator and facebook

Technical Challenges: SC'08 List

1. Interactive HPC – exploring bandwidth sufficiency from the computational elements to multiple external users.
2. HPC I/O Structure – HPC structure that best supports interactive users.
3. Simulation as an IT Service – using HPC as the server-side of a ubiquitous software service.
4. Fault Tolerance – auto restarting a job when a processor dies, and doing so without losing the partial data that was in the works.
5. Processing Hierarchy - introduction of a processing hierarchy in the logic of simulation architecture design.
6. Organizational Acceptance - technical and organizational challenges of using a shared resource for interactive simulation, rather than distributed commodity hardware.
7. Parallel Programming – training the simulation industry in parallel programming techniques, vs. the network programming that has dominated for 20 years.
8. Cloud Compute Environments – load-balancing and task assignment in a network of HPCs and traditional workstations.
9. Interactive User Security – verification of users communicating with jobs on open ports.

New Ideas

- Collect the result of the brainstorm