Petascale Computing for Military Operations

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ABSTRACT: The traditional combat models we have employed to date can no longer represent current military operations. The reasons for this are threefold: limited scale, insufficient fidelity, and inadequate combat focus. Ironically, all three share a common root cause; namely, lack of processing ability. The legacy codes in use have had to make compromises in order to operate within the distributed processing environments for which they were developed. At the same time the models have been proliferating, military operations have become significantly more integrated, thus increasing the gap between simulations and operations. There is now a confluence of events that provide a dramatic opportunity for the use of new high productivity computer systems (HPCS) computing systems for the Department of Defense (DoD). Investments by US JFCOM, PEO STRI, DARPA and HPCMO are already coupling HPC resources with operational needs to support the radical transformation of the US military. HPCS-level resources can provide exciting new capabilities to the warfighter by combining HPC-based functional, physical, logical, and behavioral models of battlespace components and effects in a human-in-the-loop application. But it needs to be done in a disciplined manner. By taking advantage of the convergence of the processing capabilities of the HPCS resources, the component nature of emerging simulations, such as OneSAF Objective System (OOS), and the location transparency provided by the long haul networks, we propose to replace the selected component elements of OOS architecture with either high-fidelity, first order physics models or proxy interfaces to operational systems. In doing so, we are replacing the areas that traditionally have been most simplified by the computational and network limitations of the distributed processing model with those elements most needed to emulate current military operations.

While the reduced cost of determining the war fighting impacts of various resource allocations is a major benefit of Forces Modeling and Simulation (FMS) on a HPCS-level resource, the most significant benefit is closing the gap between simulations and operations. More realistic training, experimentation, analysis, and planning will lead to a reduction in casualties and an increase in mission effectiveness. With the complexity of the modern and future battle space, this can only be done on a HPCS class resource.

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