HIP-15-025: Remote Interactive Visualization for High Performance RF Device Simulation Environments

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Synopsis

The project seeks to integrate the HPC version of NRL's 3D Electromagnetic PIC Code Neptune with ParaView into a data-parallel framework for remote interactive visualization and monitoring, using in-situ data co-processing.

Value to the Organization

Accurate, highly efficient, physics-based computational tools such as Neptune are indispensable during the design stages of RF amplifier development. The ultimate payoff for the Navy/DoD will be the increased scalability of the visual analytics component of a mission-critical RF simulation code, allowing for faster, more accurate device optimization.

Intern

Mr. Krishna Pai, Computer Science, Senior Year, University of Maryland at College Park

Contribution to Project:

The intern was instrumental in developing a basic prototype of an integrated remote visualization framework. He was responsible for installing, testing and customizing ParaView on a variety of platforms – from a local multi-GPU workstation, to several DSRC systems, to an NRL-based multi-GPU computational cluster. He experimented with a variety of networking scenarios, and solved a number of difficult configuration issues arising from security-related connectivity limitations, as well as the unavailability of certain software features and documentation details.

Results

- Developed appropriate connection configurations for ParaView's client/server architecture on local and DSRC HPC systems and created an instruction manual for implementing such configurations.
- Reconfigured Neptune for exporting a concurrent visualization-driven data stream
- Generated remote data-distributed visualizations using spatially partitioned data
- Experimented with efficient schemes for concurrent spatio-temporal partitioning of simulation data.

Importance to Intern

- The intern participated in the Summer Intern Orientation, which provided, among other things, an overview of employment opportunities at NRL
- The intern was given a tour of the HPC center at NRL
- The intern became familiar with various HPC software development environments, as well as HPCMP productivity and Visualization Tools, through online training, or direct mentoring
- The intern went through mandatory Cyber-Security training, and was exposed to information related to network security issues of various HPC systems.