**Data from Petascale and Exascale Simulations**

One of the largest sources of data is that produced from the large-scale simulations running today on petascale and being planned for exascale systems. This data is produced for two important reasons. One is to provide checkpointing for restart and the second is for visualization and analysis of simulation results. As machines grow in performance, the data produced by simulations naturally scales in size but the associated challenges grow even more as the mean time between failure (MTBF) of total system grows and the compute performance of high end supercomputers tends to grow much faster than disk I/O bandwidth is increasing. There have been several studies of these issues recently [[1-3](#_ENREF_1)] as part of studies of the next generation exascale systems. The latter will have up to a billion concurrent processes (perhaps arranged as a 1000 threads on each of a million nodes) compared to large simulations today on over 100,000 cores. A new area of study is emerging of processing simulation data in parallel on the nodes of a supercomputer with ADIOS being an interesting approach [[4-6](#_ENREF_4)]. A study of fusion simulations [[2](#_ENREF_2)] identified need to output 2 gigabytes of data per simulated time step for each core in the parallel simulation. For “just” a million cores this corresponds to 2 petabytes of data per time step requiring an aggregate I/O rate of 3.5 terabytes/second for a ten minute time step with a simulation of 1 billion cells and 1 trillion particles. An exascale simulation might be 100 times this rate. These data rates are clearly much larger than those associated with observational data although checkpoint data for example can be overwritten and perhaps visualization data will be analyzed in place (by parallel algorithms on same nodes as simulation) and reduced in size before permanent storage.

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