10K$ Supercomputer

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This project develops a full supercomputer system costing only $10K, using off-the-shelf Graphics Processing Units (GPUs). GPUs have demonstrated substantial processing power, with hundreds of processing cores embedded in them, at a fraction of cost of general-purpose processors. Despite that GPUs target specific graphics processing, there is currently a growing interest in the scientific community to utilize the GPUs processing power in general purpose non-graphical applications. The target of this research is study the potential of GPUs in scientific/industrial applications. The research would build and integrate a prototype supercomputer using a cluster of GPUs together with researching high-performance run-time management system that harnesses that tremendous computation power. The project would research for novel load-balancing, process scheduling, and use of open standards (such as openCL, MPI, and OpenMP) for exploiting that processing power. The research output would be a GPU-based supercomputer which only costs $10K to built giving the processor power available by $1M supercomputer for typical scientific applications.

The project would also implement a typical high-performance application as a case study to analyse the utility of the supercomputer. The project would allow for joint research work between Japanese expert-team focusing on a scientific problem (such as nanotechnology) as a case study, and E-JUST team focusing on high-performance processing aspects. Such a supercomputer system would also allow for providing highly affordable processing power making it possible to efficiently handle large-scale industrial and scientific problems.