Paper Title: High Performance Computing based on a Smart Grid approach

Paper Link: https://ieeexplore.ieee.org/abstract/document/7968628

1 Summary:

1.1 Motivation

This paper addresses the costs of computation and storage when it comes to High Performance Computing. The authors stated virtualization techniques in High-Performance Computing (HPC), emphasizing the use of cloud-based virtualization to reduce computation and storage costs. The proposed architecture addresses communication challenges, focusing on distributed heterogeneous computing with personal computers and high-performance GPUs. The challenge is to encourage resource sharing, considering energy consumption costs. The authors suggest a smart grid approach to incentivize sharing for computational purposes, providing easy access to resources with costs tied to energy consumption and interest.

1.2 Contribution

The research's contribution is that the model presented in this paper has the potential to decrease the computational and operating costs when it comes to sharing HPC computation resources.

1.3 Methodology

SEA and CEA were implemented in the methodology of this paper, which helped to eliminate the reliance on data centers, clusters, or cloud services. Moreover, a TCP/IP infrastructure was used and the usage of GPU virtualization was also executed.

1.4 Conclusion

This paper has the potential of creating a High-Performance Computing (HPC) infrastructure similar to volunteer computing, by using the SEA and CEA architecture. Also, a new framework is introduced with a proof-of-concept goal, for the evaluation of energy consumption.

2 Limitations:

2.1 First Limitation:

The geographical spares computers are not suitable for many parallel algorithms. This poses drawbacks regarding the communication between servers.

2.2 Second Limitation

It might increase the cost itself. Sharing the resource; whether it’s CPU or GPU, will consume more energy, therefore increasing the cost. However, this issue can be tackled easily by quantifying the resources.

3 Synthesis:

This model can be used to assess the performance of smart grids and create an Application Programming Interface (API) for easy utilization of the grid, which will ultimately cut the costing and power consumption of CPU and GPU resources.