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Many-core on the Grid: From Exploration to Production

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A number of High Energy Physics experiments have successfully run feasibility studies to demonstrate that many-core devices such as GPGPUs can be used to accelerate algorithms for trigger systems and data analysis. After this exploration phase experiments on the Large Hadron Collider are now investigating how these devices can be incorporated into key areas of their software framework in advance of the significant increase in data volume expected in the next phase of LHC operations.

A recent survey performed by the EGI GPGPU Resource Centre indicates that there is increasing community interest for GPUs to be made available on the existing grid infrastructure. However, despite this anticipated usage there is no standard method available to run GPU-based applications in distributed computing environments. Before GPU resources are available on the grid operational issues such as job scheduling and resource discovery will have to be addressed. For example, software developed for many-core devices is often optimised for a particular device and therefore specific architecture details - such as GPU shared memory capacity and thread block size - will be required for job resource matching.

The key technical challenges for grid-enabling many-core devices will be discussed. Consideration will be given to how jobs can be scheduled to maximise device occupancy, how they can be advertised using methods familiar to the grid user-community and how their usage can be accurately evaluated for accounting purposes. A selection of GPU devices will be made available at two Tier-2 Grid sites in the UK to demonstrate resource usage. Functionality will be evaluated using software from existing many-core feasibility studies in addition to examples provided by the EPIC project who will use grid-enabled GPUs as a critical part of their workflow.

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