**Buy-In**

**Overview**

The University of Arizona’s High Performance Computing (HPC) clusters tend to be a set of computing nodes and associated high performance storage. There are additional nodes to meet specific needs like large memory or GPUs. For researchers who need compute resource beyond the standard allocation, and who have funding available, we encourage 'buy-in' of additional compute nodes.

**Benefits to Buy-In**

**Dedicated Research Compute.** Research groups can 'Buy-In' (add resources such as processors, memory, storage, etc.) to the base HPC systems as funding becomes available. Researchers receive 100% of the CPU-hour time their purchases create as a monthly high-priority allocation. This is the highest priority queue on the HPC systems.

**Quality Environment.** The Buy-In option allows research groups to take advantage of the central machine room space that is designed for maintaining high performance computing resources. The UITS Research Technologies group physically maintains the purchased nodes, applies updates and patches, monitors the systems for performance and security, and manages software. Additionally, Research Technologies staff is available for research support and questions through hpc-consult@list.arizona.edu. In short, essentially all costs associated with maintaining compute resources are covered by UITS rather than individual researchers.

**Flexible Capacity.** Buy-In research group members also benefit from their resources being integrated into a larger computing resource. This means the buy-in resources can be used in conjunction with the free allocation and resources provided to address computational projects that would be beyond the capacity of a group running an independent system alone.

**Shared Resource.** The University Research Computing Community as a whole benefits from buy-in expansions to the HPC systems. As mentioned above, researchers who buy-in receive 100% of the allocation of time for their purchase. However if the buy-in resources are not fully utilized, they are made available as windfall resources. This helps to ensure full use of all HPC resources and can be used to justify future purchases of computing resources.

**Cost Competitiveness.** Lower costs included in the grant proposals (i.e. hardware only, no operations costs) and evidence of campus costsharing give a positive advantage during funding agency review.

**Pricing.** For the year following the award the UA HPC request for proposal (RFP) pricing is locked in and is often considerably less than the "market price."

**Buy-In Details**

**Estimates.** We are currently going through a request for proposal for the next HPC machine (target live date: Q1 2020). Best and final offer for the RFP process should be completed sometime in September 2019, and exact details for buy-in will be available afterwards.

As a guideline the most recent prices for buy-in nodes are about $8,500 for a standard node (28-core, 196GB memory, 1TB internal hard drive) and $13,800 for a node that contains an NVIDIA P100 GPU accelerator. Each buy-in node provides approximately 20,000 cpu-wallclock-hours per month (28-core, 24 hours/day, 30 days/month).

**Policies.** Standard and high priority jobs will preempt windfall jobs when necessary. High priority jobs are run on both the buy-in nodes and the centrally funded nodes. So it is possible to consume high priority allocation in a shorter period of time than the one month allocation. This can be an advantage if there is a short-term project deadline (submit or present results in a publication or conference, etc.).

The HPC 'Buy-in' program is not designed to replace or compete with the very largescale resources at national NSF and DOE facilities, e.g. XSEDE and the Open Science Grid. National resources are available at no financial cost to many researchers based on competitive proposal processes. The HPC 'Buy-in' program is designed to meet the needs of many researchers with lower or mediumsacle HPC requirements, who want guaranteed access to compute resources and control of the scheduling priorities for their resources.

Detailed information and estimates for Buy-In costs can be obtained by contacting HPC Consulting:

hpc-consult@list.arizona.edu