2018 Buy-in prices for compute nodes

Michigan State University iCER/HPCC

We submitted a request for proposals (RFP) that was finalized this April for new compute nodes for the iCER/HPCC. We went through a Q&A answer period, evaluated the bids and selected a vendor: Hewlett Packard Enterprise (HPE). HPE provided a list of all the elements that we might want as well as a very competitive bid.

iCER/HPCC has committed to buying $1.5M dollars of compute nodes and $0.5M dollars of GPU nodes. As part of our commitment we are also offering Michigan State University faculty the opportunity to buy-in.

Buy-in

The basic idea of buy-in is this: If you want HPC nodes for your research, you can buy them as part of iCER/HPCC 2018 purchase. MSU requires that you pay the price of the compute hardware only. In return MSU provides racks, networking cables and switches, software, support, power, cooling, etc. What MSU receives in return for their support is the ability to use your nodes for short jobs when you are not using them.

In detail, the node(s) you buy are marked as belonging to your group. No one outside of your group can run a job of longer than 4 hours on that node. Once someone in your group requests access to your node, they would wait a maximum of 4 hours after which they can queue as many jobs as they like, and those queued jobs would be processed over any 4-hour job requests. When no one in your group is running jobs on the node, then 4-hour jobs can again get access to the node.

Compute Node Classes

These are the compute nodes that you can buy and their associated prices. These prices include 4 years of support from HPE.

Basic Compute

These are all 2-socket nodes with Intel Xeon SP Gold 6148 processors with 20 cores each, meaning each node has a total of 40 cores. Nodes may do up to 2 double-precision teraflops per node, about double the Intel16 cluster. Each node has a 480GB SSD for local storage and a 100 gigabit low-latency Infiniband connection. The memory footprint is based on 12 DIMM slots in each node. Note that you must fill all 12 DIMMS with the same kind of memory DIMM.
Compute Node with 40 cores, 96 GB system memory (8GB x 12) | $ 8,150.77
Compute Node with 40 cores, 192 GB system memory (16GB x 12) | $ 9,257.46
Compute Node with 40 cores, 384 GB system memory (32GB x 12) | $ 11,870.33
Compute Node with 768 GB system memory (64GB x 12) | $ 18,142.92

Note that the price of memory has risen dramatically in the last few years.

**GPU Nodes**

There are a number of complications affecting HPC GPU cards. The first is the expense of NVIDIA’s latest GPU offering, the Volta V100. The second is the difficulty in getting cheaper consumer grade cards, given both their popularity in cryptocurrency mining and that NVIDIA is pushing for consumer cards to be used in gaming rigs, not HPC. To this end, NVIDIA has changed the license on recent drivers. The license restricts use of commercial cards in a data center for non-cryptocurrency applications. Many popular software packages rely on features only available in newer software under this new EULA. While NVIDIA has stated that they do not intend to enforce this provision on academic research centers, the license does not reflect that.

We are taking a dual approach. iCER/HPCC is exclusively buying 32 GB Volta V100 cards. These are the latest, greatest Nvidia offering which give x5 -- x7 performance increases in areas like machine learning, though less in other areas. We were able to get very aggressive pricing on the V100s and we will be one of the first sites to have 32 GB V100s. Given our concerns about licensing and that iCER/HPC is focused on providing access to the best available technology, we will not be buying consumer gaming cards.

However, that does not prevent you from buying such rigs if that is what you would prefer. We will offer a 2-socket/40 core/384 GB node with 8 empty dual-width PCIe x16 slots. You can buy these nodes and populate them with GPUs under the following two provisos:

1) You, dear user, are going to have to buy the cards (if they are not V100). HPE cannot (is forbidden by NVIDIA to) sell us a server with cards. Besides, the sourcing of such cards is problematic. ICER/HPC can't really be of much help either except in the way of advice.

2) We will check some number of cards for compatibility with our systems. We will allow only those cards that we approve to go into nodes in the iCER/HPC system. We know that some cards simply don't work well in our environment. Support will be on a best-effort basis. We’ll do the best we can but we are on our own as we can’t rely on support from HPE or NVIDIA for these configurations.

### Pricing

<table>
<thead>
<tr>
<th>Apollo 6500 chassis (40 core / 384 GB) no cards and 8 PCIe slots</th>
<th>$ 18,432.38</th>
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<tbody>
<tr>
<td>NVIDIA V100 32 GB GPU</td>
<td>$ 6,994.52</td>
</tr>
<tr>
<td>Apollo 6500 chassis (40 core / 384 GB) with 8xV100 (32 GB) SXM2</td>
<td>$ 74,338.54</td>
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For comparison, NVIDIA sells their comparable DGX-1 compute node with less capable CPUs and \( \frac{1}{2} \) the memory per card for a list price of $150K. This is a remarkably good deal and one of the reasons we went with HPE.

If you would like to purchase V100 nodes but would prefer fewer V100s per node or only need 16 GB V100s, please let us know and we can work something out.

Large Memory Nodes

As in the past, we also offer a "large memory" node. HPE provided us a node with 4 Intel Xeon Gold 6148 CPUs (a total of 80 cores) and 3 TB of memory (48 * 64 GB.)

| DL560 Gen 10 with 3 TB of system memory (48GB x 64) | $ 54,976.03 |

Timeline

We will be making our purchase at the end of May, perhaps the first week of June.

If you cannot buy in the next week or two, know that these prices will be good for 6 months but, after that date, we will not be able to buy at these very good prices.

We expect to get these machines into the new center in mid-July. If you order after the initial purchase, expect a wait until at least September.