Clusters - Prince

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Overview

Prince is the main NYU HPC cluster. The Mercer cluster was decommissioned on May 19th, 2017.

Hardware Specifications

<table>
<thead>
<tr>
<th>System Name</th>
<th>HPC Cluster Prince</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor</td>
<td>Dell</td>
</tr>
</tbody>
</table>
| Network     | • Infiniband by Mellanox for MPI and access to file systems (home (ZFS), scratch (Luster and BeeGFS), and archive)  
• 10Gbit Management Network (node provisioning and configuration)  
• 1 Gb Ethernet Service Network for IPMI/DRAC access  
• 10Gbit access to the public NYU Network (only available on the Prince login nodes and selected management nodes) |
| Operating System | CentOS 7.4 |
| Login Nodes | 2 login nodes: prince0 and prince1.hpc.nyu.edu  
Each login node has 2 Intel Xeon E5-2680v4 2.4GHz CPUs (“Broadwell”, 14 cores/socket, a total of 28 cores/login node) and 128 GB memory |
### Comput Nodes

**Standard Compute Nodes**

- 4 nodes (Dell PowerEdge C6420 in a 6400 chassis enclosure) each will 2 Intel Xeon Gold 6148 2.4GHz CPUs ("Skylake", 20 cores/socket, 40 cores/node) and 187GB memory, EDR interconnects. Nodes: c42-[0-4]
- 68 nodes each with 2 Intel Xeon E5-2690v4 2.6GHz CPUs ("Broadwell", 14 cores/socket, 28 cores/node) and 125GB memory, EDR interconnects
- 32 nodes each with 2 Intel Xeon E5-2690v4 2.6GHz CPUs ("Broadwell", 14 cores/socket, 28 cores/node) and 250GB memory, EDR interconnects
- 32 nodes each with 2 Intel Xeon E5-2660v3 2.6GHz CPUs ("Haswell", 10 cores/socket, 20 cores/node) and 62GB memory. The 32 nodes are M630 Blade servers on 2 M100e chassis and are interconnected via FDR Infiniband
- 64 nodes each with 2 Intel Xeon E5-2690v2 3.0GHz CPUs ("Ivy Bridge", 10 cores/socket, 20 cores/node) and 62GB memory. The 64 nodes are M620 Blade servers on 4 M100e chassis and are interconnected via FDR Infiniband (used to be Mercer chassis 0, 1, 2, 3)
- 112 nodes each with 2 Intel Xeon E-2690v2 3.0GHz CPUs ("Ivy Bridge", 10 cores/socket, 20 cores/node) and 62GB memory. The 112 nodes are M620 Blade servers on 7 M100e chassis and are interconnected via QDR Infiniband (Mercer chassis 14-20)
- 48 nodes each with 2 Intel Xeon E-2690v2 3.0GHz CPUs ("Ivy Bridge", 10 cores/socket, 20 cores/node) and 189GB memory. The 48 nodes are M620 Blade servers on 3 M100e chassis and are interconnected via QDR Infiniband (Mercer chassis 21-23)

**Nodes equipped with NVIDIA GPUs**

- 6 nodes each with 2 Intel Xeon Gold 6148 2.4GHz CPUs ("Skylake", 20 cores/socket, 40 cores/node) and 384GB memory, EDR interconnects, each node equipped with 4 NVIDIA V100 SXM2 GPUs (16GB) connected with NVLink
- 1 node with 2 Intel Xeon Gold 6148 2.4GHz CPUs ("Skylake", 20 cores/socket, 40 cores/node) and 192GB memory, EDR interconnects, each node equipped with 2 NVIDIA V100 PCIe GPUs (16GB) connected via PCIe
- 6 nodes each with 2 Intel Xeon E5-2690v4 2.6GHz CPUs ("Broadwell", 14 cores/socket, 28 cores/node) and 256GB memory, EDR interconnects, each node equipped with 4 NVIDIA P100 GPUs (16GB)
- 24 nodes each with 2 Intel Xeon E5-2690v4 2.6GHz CPUs ("Broadwell", 14 cores/socket, 28 cores/node) and 256GB memory, EDR interconnects, each node equipped with 4 NVIDIA P40 GPUs (24GB)
- 9 nodes each with 2 Intel Xeon E5-2690v4 2.6GHz CPUs ("Broadwell", 14 cores/socket, 28 cores/node) and 256GB memory, EDR interconnects, each node equipped with 2 NVIDIA K80 GPUs (24GB, split between 2 GPU cards)
- 6 nodes each with 2 Intel Xeon E5-2670v2 2.5GHz CPUs ("Ivy Bridge", 10 cores/socket, 20 cores/node) and 128 GB memory, FDR interconnects, each node equipped with 4 NVIDIA K80 GPUs
- 4 nodes each with 2 Intel Xeon E5-2690v4 2.6GHz CPUs ("Broadwell", 14 cores/socket, 28 cores/node) and 128GB memory, EDR interconnects, each node equipped with 4 NVIDIA GTX 1080 GPUs (8 GB)

**Nodes with INTEL Xeon Phi processors**

- 2 nodes (DELL C6320P) with "Knights Landing" Intel Xeon Phi processor 7210 1.3 GHz 64 cores, 16GB MCDRAM, 188 GB DDR4 memory, EDR interconnects.

**Medium Memory Node**

- 4 nodes each with 2 Intel Xeon E5-2687Wv3 3.1GHz ("Haswell", 10 cores/socket, 20 cores/node), 512GB memory, FDR interconnects.

**High Memory Nodes**

- 2 nodes each with 4 Intel Xeon E7-8857v2 3.0GHz ("Ivy Bridge", 12 cores/socket, 48 cores/node), 1.5TB of memory, FDR interconnects.

### Total Nodes

430 (428 Compute Nodes + 2 Login Nodes)

### CPU cores

10,084 CPU cores on compute nodes + 56 CPU cores on login nodes

### GPUs

- 26 NVIDIA V100 (16GB)
- 32 NVIDIA P100 (16GB)
- 96 NVIDIA P40 (24GB)
- 50 NVIDIA K80 (24GB)
- 16 NVIDIA GTX 1080 (8GB)

### INTEL PHI

128 Xeon Phi 7210 "Knights Landing" physical cores

### Total memory

58TB for compute + 256GB for login nodes

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### File Systems

The table below shows the File Systems available on the Prince Cluster.
<table>
<thead>
<tr>
<th>Mountpoint</th>
<th>Storage Capacity</th>
<th>FS Type</th>
<th>Backed up?</th>
<th>Flushed?</th>
<th>Availability</th>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>/home</td>
<td>43 TB (20 GB / user)</td>
<td>ZFS</td>
<td>Yes</td>
<td>No</td>
<td>All Prince nodes (login, compute)</td>
<td>$HOME</td>
<td>/home/$USER</td>
</tr>
<tr>
<td>/scratch</td>
<td>1.1 PB (5 TB / user)</td>
<td>Lustre</td>
<td>NO</td>
<td>YES</td>
<td>All Prince nodes (login, compute)</td>
<td>$SCRATCH</td>
<td>/scratch/$USER</td>
</tr>
<tr>
<td>/beegfs</td>
<td>500TB (2 TB / user)</td>
<td>BeeGFS</td>
<td>NO</td>
<td>YES</td>
<td>All nodes (login, compute)</td>
<td>$BEEGFS</td>
<td>/beegfs/$USER</td>
</tr>
<tr>
<td>/archive</td>
<td>700 TB (2 TB / user)</td>
<td>ZFS</td>
<td>Yes</td>
<td>No</td>
<td>Only on login nodes</td>
<td>$ARCHIVE</td>
<td>/archive/$USER</td>
</tr>
<tr>
<td>/state</td>
<td>Varies, mostly &gt;100GB</td>
<td>ext3</td>
<td>NO</td>
<td>YES</td>
<td>Separate local filesystem on each compute node</td>
<td>$SLURM_JOBT MP</td>
<td>/state/partition1/$SLURM_JOBID</td>
</tr>
</tbody>
</table>

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