Clusters - Prince

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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/iDRAC access  
• 10Gbit access to the public NYU Network (only available on the Prince login nodes and selected management nodes) |
| Operatingsystem | 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 |
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[1-4]
- 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 62 GB memory. The 32 nodes are M630 Blade servers on 2 M1000e 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 M1000e 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 M1000e 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 M1000e 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

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>500 TB (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/particle1</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>$SLURM_JOBT MP</td>
<td>/state/particle1/$SLURM_JOBID</td>
</tr>
</tbody>
</table>