**Research Advanced Computing Services** supports research computing at the University of Oregon by providing large-scale computing resources, performant storage, high-speed data transfer capabilities, and support for data sharing. Additionally, RACS provides consulting services in the computational sciences, training on the use RACS resources, and will support grant proposals either through formal partnerships or by providing letters of support.

RACS is home to the University of Oregon's flagship research computing cluster, Talapas. Talapas is a heterogeneous supercomputing cluster capable of performing over 250 trillion calculations every second and providing 1.5 petabytes (1,500 trillion bytes) of high performance, parallel data storage. Talapas makes three distinct classes of compute nodes available to researchers: standard compute nodes built around the Intel "Broadwell" generation of processor, GPU compute nodes equipped with dual nVidia Tesla K80 accelerators, and large memory servers.

| **Qty** | **Node Type** | **Processors (total cores)** | **Memory** | **Local Storage** | **Networking** | **Accelerator** |
| --- | --- | --- | --- | --- | --- | --- |
| 96 | Standard Nodes | dual E5-2690v4 (28 cores) | 128GB | 200GB SSD | Single Port EDR InfiniBand | N/A |
| 24 | GPU Nodes | dual E5-2690v4 (28 cores) | 256GB | 200GB SSD | Single Port EDR InfiniBand | Dual NVIDIA Tesla K80 |
| 8 | Large Memory Nodes | quad E7-4830v4 (56 cores) | 1TB, 2TB, or 4TB | dual 480GB SSD | Single Port EDR InfiniBand | N/A |

Storage Hardware: All compute resources are connected to our DDN GRIDScaler 14k storage appliance via the EDR InfiniBand interconnect. The DDN appliance runs GPFS and provides over 1.5 PB of usable storage.

| **Appliance** | **Enclosures** | **Drives** | **Filesystem** | **Usable Space** |
| --- | --- | --- | --- | --- |
| DDN GS14k | 5 SS8462 84-slot enclosures | 10 800GB Mixed Use SSD Drives (metadata) | GPFS | 1,579 TiB |
|  |  | 362 6TB 7200 RMB 12Gb/s SAS 4Kn drives |  |  |
|  |  | 21 800GB Mixed Use SSD Drives (fast tier) |  |  |

All compute nodes and the DDN storage controllers are connected via a high speed EDR InfiniBand network providing 100Gbit/s throughput. The network is arranged in a "fat-tree" topology with compute nodes connected to leaf switches and all leaf switches connected to core switches. Currently, the network is configured with a 2:1 overall blocking ratio, i.e. there are twice the number of connections up from the nodes to the leaf switches as there are from the leaf switches to the core switches. This allows us to scale economically while providing unblocked communication between the 24 compute nodes that share a common leaf switch. The two DDN storage controllers each have dual connections to the InfiniBand core switches.

The acquisition and deployment of Talapas marks a new era for research computing at the University of Oregon. A true research cluster, Talapas is designed to accommodate a wide variety of workflows, from classical MPI based distributed computing to GPU accelerated simulations to large memory applications. This heterogeneous design delivers a single cluster that can effectively serve the unique needs of the diverse computational research community at the University of Oregon. Located in the state-of-the-art Allen Hall Data Center, Talapas is currently in late stage open beta testing and is available for use by all researchers at the University of Oregon.