Spring 2019 HPC Operating Committee Minutes

March 11, 2019

**Attendees**: Kyle Mandli (Chair), George Garrett, Dali Plavsic, Tian Zheng, Simon Tavaré, Julia Hirschberg, Benny Chang, Axinia Radeva, Alexandra Karambelas, Zachary Fuller, Lorenzo Sironi, Arie Zask, Raphael Dussin, Rajendra Bose, Jochen Weber, Marc Spiegelman, Halayn Hescock, Ariel Sanchez, Cesar Arias

Kyle Mandli, Chair of the HPC Operating Committee, opens the meeting by welcoming members to the Spring 2019 meeting, and after introductions by attendees, turns the floor over to George Garrett, Manager of Research Computing Services within CUIT.

**HPC Clusters - Overview and Usage**

There are four ways to participate in the University’s high-performance computing initiative: Purchasing nodes, Renting nodes, the Free Tier (with limited access), and the Education Tier (supported by the Engineering School and Arts and Sciences).

The Terremoto cluster was launched in December 2018 and has 24 research groups, 190 users, 2.1 million core hours utilized, and a 5 year equipment lifetime. It consists of 110 compute nodes, 430 TB storage, Dell hardware, Dual Skylake Gold 6126 cpus and uses the Slurm job scheduler. Please refer to the slides for additional details.

Terremoto usage has been moderate so far with a couple spikes nearing maximum capacity. This is due primarily to the fact that some research groups have not yet begun utilizing the system. As shown in the slides, the majority of jobs run on both Terremoto and Habanero are small, often requiring a single server or only a portion of a server (between 1 to 24 cores). There are a few groups who do consistently run larger jobs, often employing around 10 nodes (240 cores), and a handful of users that run jobs requiring over 240 cores.

The High Performance LINPACK (HPL) benchmark is the standard benchmark for HPC clusters and is used to benchmark and ensure expected performance on the clusters. Terremoto runs the HPL benchmark 44% faster than Habanero due to it's faster clock speed and advanced vector extensions AVX-512.

The Terremoto 2019 HPC Expansion round is in planning stages and an announcement will be sent out in April. The purchase round will commence in late Spring 2019. HPC expansion rounds have been occurring annually and will continue at this cadence as long as there is sufficient demand. If you are aware of potential demand, including new faculty recruits who may be interested, please contact [rcs@columbia.edu](mailto:rcs@columbia.edu).

Habanero consists of 302 nodes (7248 cores) and 740 TB of storage. The first 222 nodes expire in December 2020 and the remaining 80 nodes will expire in December 2021.

Habanero participation continues to grow and has 44 research groups or departments, over 1,500 users, 9 renters, 160 free tier users and has hosted 15 courses using the Education tier since launch.

Habanero continues to be highly utilized. In November 2018, the job scheduler was configured to enforce memory limits which fixed an issue in which memory on shared nodes would be oversubscribed and occasionally cause high memory jobs to fail. The memory enforcement adjustment fixed this issue and as a result reduces the total core hour utilization of the cluster, because memory oversubscription was no longer allowed. Jochen asks whether users should be notified about memory limit usage. RCS responds that many have already been notified and that RCS will more closely survey memory usage to ensure that people aren't requesting much more than than they are actually using.

Singularity, which is now available on both Terremoto and Habanero, provides an easy to use, container solution for HPC. Typical use cases include instant deployment of complex software stacks and allows running other Linux operating systems on our HPC systems. This will also make it easier to rapidly deploy and support newer versions of software, such as Tensorflow. Jochen asked whether there may be a minimal presentation about Singularity, to which RCS responded that we are working on the documentation now and would be happy to hold a tutorial session on Singularity.

OpenOndemand HPC web portal software, which RCS is currently testing internally, will provide a modernization of the HPC user experience and will be piloted starting Spring 2019. It allows interactive HPC such as submitting and monitoring jobs, connecting to the cluster, and transfering files all via a web interface. Lorenzo asks if OpenOndemand is similar to VNC. RCS responds that it is not identical, but can provide very similar features including the potential to launch desktop environments, which RCS is testing.

The Yeti cluster compute nodes have all been retired as of March 1st, 2019. The Yeti storage system will be shut down on March 15, 2019. Kyle asks whether we have Yeti final numbers for historical purposes. This could include machine usage information as well as a list of citations of research done on Yeti. George replies that we don't have usage information on hand but will compile any information we can find. There is a list of reported [Yeti publications](https://research.columbia.edu/content/srcpac/yetipublications) on the SRCPAC site.

The Data Center Cooling Expansion, with expected completion in Spring 2019, assures HPC capacity for the next several generations.

**Overview of Business Rules**

Any special usage requests should be sent to [hpc-support@columbia.edu](mailto:hpc-support@columbia.edu) and RCS will contact Kyle Mandli as necessary for approval.

Nodes owned by individual users have the fewest restrictions, with priority access for the dedicated node owners. Vice versa, nodes owned by other accounts carry the most restrictions.

For Public nodes, there are few restrictions, but nobody has priority.

The maximum wall time is 5 days on nodes owned by your group or on public nodes. Jobs that ask for 12 hours or less can run on any node.

Every job is assigned a priority: “Fair Share” is determined by target share (determined by the number of nodes owned by each account) and recent use (number of core hours used recently; calculated at the individual and group level). If recent use is less than the target share, the job priority increases; users using more of their target share see their priority decrease. Jochen asks whether the half life of recent usage decay is really two weeks and George responds that the half life is indeed 2 weeks, and that recent usage is not reset after 14 days.

**Support**

The RCS team offers a number of support methods, including open office hours and group information sessions, as well as training (more information can be found on the corresponding presentation slides). The [Foundations for Research Computing](https://rcfoundations.research.columbia.edu/) initiative was highlighted as a useful resource for upcoming workshops and other events.

**HPC Publications Reporting**

Reporting research publications which used local HPC resources is critical for demonstrating to University leadership the utility of supporting research computing. Please report new publications utilizing one or more of these machines to [srcpac@columbia.edu](mailto:srcpac@columbia.edu). Julia suggests sending all HPC users (not just the PIs) requests for HPC publications which will be more effective. Raphael suggests asking for publications on the message displayed to users when they log in to the clusters. Tian suggests displaying a request to report publications more prominently in our user documentation. RCS agrees that these are all good ideas and will implement these suggestions.

**Feedback and Discussion**

George opens up the floor for feedback and invites people to share their experience using the HPC clusters. Lorenzo says that the 12 hour and 5 day job rules work well. He prefers these rules over another institution's "controversial" cluster policies which he had experienced. Jochen thanks RCS for their support and effective collaboration. Tian shares student feedback that things are working well in general, but that the latest version of TensorFlow is not available. George mentions that Singularity should solve this issue. Kyle asks whether there are any licensing issues with Singularity, for example running Intel Parallel Studio in Singularity. John says that the Singularity container can simply connect over the network to our current license server and this should not be an issue.

Tian asks whether Jupyterhub can be installed on Terremoto, since it is already installed on Habanero. RCS responds that yes, this can be made available. Simon asks whether there are any strategic plans for cloud computing. Tian mentions that cloud computing strategy is often discussed as part of the SRCPAC cloud computing initiatives and invites him to attend the upcoming SRCPAC meeting.