Virtual supercomputer – HPC cloud at your fingertips

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Abstract.

VSC (Virtual Super Computer) is HPC on-demand management software with bare-metal performance and unlimited scalability being developed by Massive Solutions. The software can span a public or private HPC cloud on top of existing infrastructure. There is no need to change the existing HPC system software stack to enable "HPC as a service" model on the up and running cluster.

The software co-exists with existing "shared resource" cluster infrastructure and adds the ability to provide HPC on-demand services within same physical cluster resources. An unlimited number of physical clusters, which are not necessary to be the same architecture, can be put under control by VSC platform to provide same on-demand experience to the end users.

We call virtual supercomputer as virtual in the sense that physical resources which are needed are allocated per "on-demand" request and they are fully isolated from the rest of cluster. The virtual supercomputer is up and running within several minutes with the pre-built images. Once the virtual cluster is up and running a user can immediately run mpi job without any additional tweaks. A user has full control of virtual cluster with "root" privileges and can install other software and make fine-tuning of the software stack in the "admin" fashion. All changes done by the user in the virtual cluster configuration can be saved into custom image for future re-use.

There are no changes in the HPC user experience once you start using virtual supercomputer. Everything what can be done on the physical cluster can be done on the virtual cluster with the same user experience and same performance.

The virtual cluster can be spanned on the InfiniBand based physical resources as it uses InfiniBand virtualization to isolate network resources. VSC is not using physical Ethernet at all, instead all Ethernet traffic go through InfiniBand by means of EoIB (Ethernet-over-IB).

VCS technology benefits for HPC Center:

1. HPC-as-a-service model can co-exist with the traditional "shared resources" model on the same physical resources.
2. HPC SaaS and PaaS services can be provided to both academic and commercial end-users using same physical resources with full logical isolation
3. End-users have access to a full custom software environment and do not interfer with the production "shared" cluster environment
4. Integrated flexible billing capabilities to the end-users
5. HPC on-demand resources are provided to the end-users in secured fashion
6. All separate clusters can be consolidated into unified HPC on-demand environment with the same user experience

VSC technology benefits for end-users:

1. Easy-to-use access to supercomputer resources in the cloud fashion
2. Full control over virtual supercomputer by means of having a "root" privileges
3. Access to a secured, fully isolated HPC resource on-demand
4. Unlimited choice of custom HPC environment and custom images for future re-use
5. No performance compromises – virtual supercomputer runs with near bare-metal performance
6. Uniform access to different physical resources