DANISH e-INFRASTRUCTURE COOPERATION

2013-03-12/RB

Bilag 1

DeIC (DCSC) Scientific Computing Installations

DeIC, previously DCSC, currently has a number of scientific computing installations, distributed at five regional operating centres. These are located at the Technical University of Denmark (DCSC/DTU), University of Copenhagen (DCSC/KU), University of Southern Denmark (DCSC/SDU), Aarhus University (DCSC/AU) and Aalborg University (DCSC/AAU).

Details on each installation are provided below:

1 DCSC/AU: HUGE

- **Computer type and Vender (Cluster/SMP)**: Four IBM power6/7 SMP-systems joined in a cluster environment.
- **Date for first day of operations (year; month)**: January 2008
- **Theoretical Peak Performance**: ca. 1.4 TFLOPS
- **Operating System**: AIX 5.3
- **Computer interconnect(s)**: 1 Gbps interconnect.
- **Processor type and speed**:
  - 1. node: 8 dualcore 4.7 Ghz IBM power6.
  - 2. node: 6 dualcore 4.7 Ghz IBM p6.
  - 3.+4. node: 32 core 3.3 GHz IBM p7 (Installed Dec. 2010, ca. 0.9 TFlops)
- **Memory (pr. Processor)**:
  - 1. node: 512 GB shared memory,
  - 2. node: 48 GB shared memory.
  - 3.+4. node: 128 GB memory each.
- **Storage Capacity**: 1.1 TB scratch file system on each node, ca. 20 TB userfilesystem.
- **Queuing system**: Torque and Maui
- **Backup**: TSM, client to the central AU-backupsystem.
- **Software**: Gaussian09; IBM compilers and ESSL (IBM Math. Library); POE (IBM's MPI)
- **Network Capacity**: Gigabit ethernet connections; 100 Mbps Firewall.
- **Miscellaneous technical information**: Userfilesystem shared with Grendel.
- **DCSC System Administrator**: Niels Carl Hansen; +45.89423201; ncwh@cscaa.dk; www.cscaa.dk

2 DCSC/AU: Grendel

- **Computer type and Vender (Cluster/SMP)**: Linux cluster from SUN, Dell, Supermicro, HP and IBM
- **Date for first day of operations (year; month)**: Aug 2007.
- **Theoretical Peak Performance**: 104 TeraFLOPS CPU + 133 / 37 TeraFLOPS (GPU, single/double precission)
- **Operating System**: CentOS 5.x / 6.x x86_64 Linux
- **Computer interconnect(s)**: Gigabit, Infiniband SDR and QDR.
- **Total nodes / total cores**: 850 / 8540

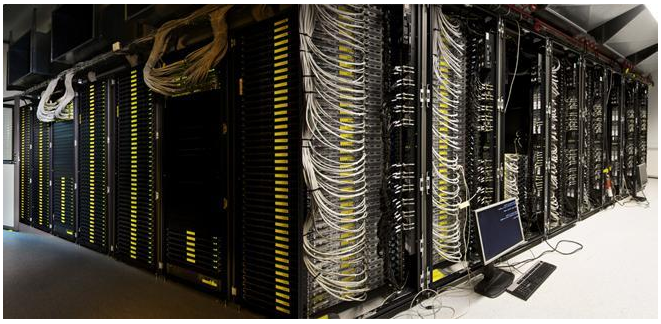
- **Processor types, speed and memory**
  - Dell/AMD 2218, 2x4 cores @ 2.6 GHz / 8 GB , 85 nodes from Aug 2007
  - SUN/AMD 2356, 2x8 cores @ 2.3 GHz / 16 GB , 230 nodes from Jan 2008
  - HP/Intel X5550, 2x8 cores @ 2.6 GHz / 24 GB, 196 nodes from Jan 2009
  - Supermicro/Intel 2x8 cores @ 2.6 GHz / 24 GB , 18 nodes from Jan 2009

  (w. 36 Nvidia 1060 GPUs)
  - HP/Intel X5650 2x6 cores @ 2.6 GHz / 48 GB, 165 nodes from Apr 2011
  - HP/AMD 6176 4x12 cores @ 2.3 GHz / 96 GB, 9 nodes from Apr 2011
  - HP/Intel X5650 2x6 cores @ 2.6 GHz / 48 GB , 40 nodes from Apr 2011

  (w. 40 Nvidia 1060, and 60 Nvidia 2050 GPUs)
  - IBM/Intel E5-2670 2x8 cores @ 2.6 GHz / 64 GB, 110 nodes from Oct 2012

- **Storage Capacity**: 175 TB user file system; between 200-1700 GB local scratch on each compute node.
- **Queuing system**: Torque and Maui
- **Backup**: TSM, client to the central AU-backupsystem.
- **Software**: Gaussian 09; WASP;; Intel compilers and MKL (Intel Math. Library); Portland Group compilers: ACML (AMD Math. library), openmpi
- **Network Capacity**: Gigabit Ethernet; 40 Gbps QDR Infiniband;100 Mbps Firewall.
- **DCSC System Administrator**: Niels Carl Hansen; +45.89423201; ncwh@cscaa.dk; www.cscaa.dk

3 DCSC/DTU: NIFLHEIM



- **Computer type and Vendor (Cluster/SMP)**: Linux cluster from HP and IBM.
- **Date for first day of operations (year; month)**: September 2012 (2006).
- **Peak performance**: 60 TeraFLOPS.
- **Operating System**: CentOS Linux.
- **Computer interconnect(s)**: QDR Infiniband, SDR Infiniband, dual-Gigabit Ethernet.
- **Processor type and speed**:
  - Dual-processor 8-core Intel Xeon E5-2670 2.6 GHz (76 nodes from 2012).
  - Dual-processor quad-core Intel Xeon X5550 2.67 GHz (116 nodes from 2010).
  - Dual-processor quad-core Intel Xeon X5570 2.93 GHz (412 nodes from 2009).
  - Dual-processor dual-core AMD Opteron 2218 2.6 GHz (162 nodes from 2007).
  - Dual-processor dual-core AMD Opteron 285 2.6 GHz (48 nodes from 2006).
- **Memory (per processor)**:

  - 4 or 8 GB RAM per CPU core in the 8-core Intel Xeon nodes.
  - 3 GB RAM per CPU core in the quad-core Intel Xeon nodes.
  - 2 or 6 GB RAM per CPU core in the AMD Opteron nodes.
- **Storage Capacity**: Central data storage 113 TB on 4 Linux NFS file servers. 11 TB on an older IBM/NetApp storage system.
- **Queuing system**: TORQUE resource manager with MAUI job scheduler.
- **Backup**: Daily backup of NFS servers to 140 TB disk storage.
- **Software**: Scientific software packages installed by user groups; Commercial compilers: Intel; Math libraries: AMD ACML, Intel MKL. Communication: OpenMPI.
- **Network Capacity**: QDR Infiniband on the 8-core Intel nodes; SDR Infiniband on 24 Opteron nodes; dual-Gigabit Ethernet on all other nodes; 1 Gbit/s external network to DTU and the Danish Research Network.
- **DCSC System Administrator**: Ole Holm Nielsen; +45.45253187; support@fysik.dtu.dk; https://wiki.fysik.dtu.dk/niflheim

4 DCSC/DTU: SUNHPC

5 DCSC/DTU: CBS

6 DCSC/DTU: Alfheim

7 DCSC/KU: Steno

8 DCSC/SDU: Horseshoe8

- **Computer type and Vender (Cluster/SMP)**: Cluster of 27 Dell C6220 nodes
- **Date for first day of operations (year; month)**: 2012; 11
- **Theoretical peak performance**: 8,3 TFlops
- **Operating System**: Linux, CentOS 6.3
- **Computer interconnect(s)**: Gigabit Ethernet
- **Processor type and speed**: 2 x Intel E5-2665 Octocore Sandy Bridge 2,4 GHz CPU's
- **Memory (pr. processor)**: 6 nodes with 8 GB/core, 21 nodes with 4GB/core
- **Storage Capacity**: 32 TB raw capacity
- **Queuing system**: Torque 2.5.12 / MAUI 3.3.1
- **Backup**: None
- **Software**: GCC 4.4.6, Intel C/C++ and Fortran 77/9x 12.0.2, Intel MKL, AMD ACML, OpenMPI 1.6.4
- **Network Capacity**: 1GBps
- **DCSC System Administrator**: Torben Madsen; +45 65503862; tm@sdu.dk; Erik Madsen; +45 65502399; erikm@sdu.dk

9 DCSC/SDU: Horseshoe7

- **Computer type and Vender (Cluster/SMP)**: Cluster of 12 Fujitsu Celcius R670-2 GPU enabled nodes.

- **Date for first day of operations (year; month)**: 2011; 09
- **Theoretical peak performance**: 1,7TFLops (CPU) +12,4 TFlops DP/ 25 TFlops SP (GPU)
- **Operating System**: Linux, CentOS 6.3
- **Computer interconnect(s)**: DDR Infiniband (20GBps), Gigabit Ethernet
- **Processor type and speed**: 2 x Intel X5670 Hexcore Westmere 2,93 GHz CPU's and 2 x NVIDIA C2070/C2075
- **Memory (pr. processor)**: 2 GB/core
- **Storage Capacity**: 48 TB raw capacity
- **Queuing system**: Torque 2.5.12 / MAUI 3.2.6
- **Backup**: None
- **Software**: GCC 4.4.6, Intel C/C++ and Fortran 77/9x 12.0.2, Intel MKL, AMD ACML, OpenMPI 1.6.4, OFED 3.5, CUDA 5.0
- **Network Capacity**: 1GBps external / 20GBps internal
- **DCSC System Administrator**: Torben Madsen; +45 65503862; tm@sdu.dk; Erik Madsen; +45 65502399; erikm@sdu.dk

10 DCSC/SDU: Horseshoe6

- **Computer type and Vender (Cluster/SMP)**: Cluster of 264 IBM iDataPlex dx-360 m2 nodes.
- **Date for first day of operations (year; month)**: 200x; YY
- **Theoretical peak performance**: 44,7 TeraFLOPS
- **Operating System**: Linux, CentOS 5.3
- **Computer interconnect(s)**: QDR Infiniband (40GBps), Gigabit Ethernet
- **Processor type and speed**: 2 x Intel X5550 Quadcore Nehalem 2,66 GHz CPU's
- **Memory (pr. processor)**: 240 nodes with 3 GB/core; 24 nodes with 6 GB/core
- **Storage Capacity**: 168 TB raw capacity
- **Queuing system**: Torque 2.4.2 / MAUI 3.2.6
- **Backup**: None
- **Software**: GCC 4.4.x, Intel C/C++ and Fortran 77/9x, Intel MKL, OpenMPI 1.3.2, OFED 1.4.2
- **Network Capacity**: 1GBps external / 40GBps internal
- **DCSC System Administrator**: Torben Madsen; +45 65503862; tm@sdu.dk; Erik Madsen; +45 65502399; erikm@sdu.dk

11 DCSC/SDU: Horseshoe5 (Retired DCSC, but still active)

- **Computer type and Vender (Cluster/SMP)**: Cluster, 72 x IBM System X3550
- **Date for first day of operations (year; month)**: 2009; 03
- **Theoretical peak performance**: 5,8 TeraFLOPS
- **Operating System**: Linux, CentOS 5.2

- **Computer interconnect(s)**: DDR Infiniband (20GBps), Gigabit Ethernet
- **Processor type and speed**: 2 x Intel L5450 QuadCore Penrynn lowpower 2,5 GHz CPU's
- **Memory (pr. core)**: 2 GB
- **Storage Capacity**: 33TB raw capacity distributed on the nodes.
- **Queuing system**: Torque 2.3.6 / MAUI 3.2.6
- **Backup**: None
- **Software**: GCC 4.1.2, OpenMPI 1.2.5, OFED 1.3
- **Network Capacity**: 1GBps external / 20GBps internal
- **DCSC System Administrator**: Torben Madsen; +45 65503862; tm@nat.dk; Erik Madsen; +45 65502399; erikm@sdu.dk

12 DCSC/AAU: Fyrkat (GTX 580)

- **Computer type and Vendor (Cluster/SMP)**: 2 (16 cores) Supermicro X8DTG-QF, 39 GB RAM, 300 GB
- **Date for first day of operations (year; month)**: 200x; YY
- **Peak performance**: (Ikke beregnet) TeraFLOPS
- **Operating System**: Ubuntu 12.04 (Precise)
- **Computer interconnect(s)**: Infiniband (10Gbps), Gigabit Ethernet
- **Processor type and speed**: 2 x Intel(R) Xeon(R) CPU X5570 @ 2.93GHz (HT Enabled)
- **GPU type**: 6 x Nvidia Tesla GTX 580 (3 pr. Node)
- **Memory (pr. processor)**: 4.8GiB
- **Storage Capacity**: 45TiB
- **Queuing system**: Slurm 2.5.3
- **Backup**: None
- **Software**: icc-10.1.018; ifort-10.1.018; gcc version 4.6.3; matlab-R2013a, CST2013, MUST
- **Network Capacity**: Gigabit Ethernet internal/external
- **DCSC System Administrator**: Mads Boye; +45 9940 3453; mb@its.aau.dk; Helge Willum Larsen; +45 9940 3458; hwl@its.aau.dk