Computing

NSC

Storage   Network

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National Supercomputer Centre

- NSC is provider of leading edge supercomputing resources to NSC partners SMHI and SAAB and to members of academic institution throughout Sweden.

- Independent organisation within Linköping University

- Staff: 17 people

- Created 1989 when LiU purchased a Cray XMP

  - Saab purchased a Cray 1A 1983. The national science council bought 2000 CPUhours/year for academic use.

Swedish National Infrastructure for Computing
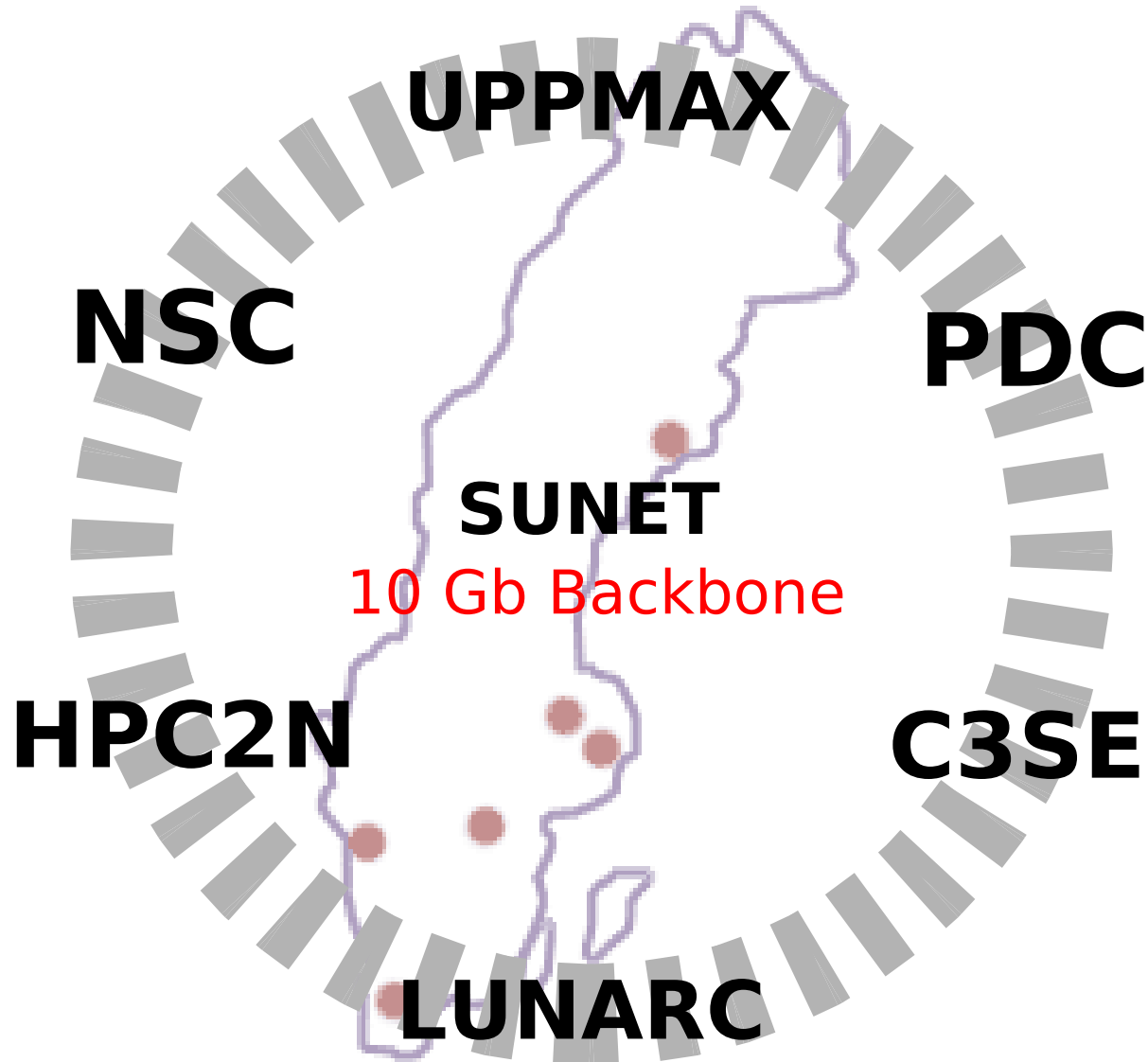
HPC computing resources @ NSC

- National Academic Resources

  - Neolith, cluster w. IB (HP)

  - Mozart, SMP

  - Smokerings, cluster

- Local Academic Resources

  - Tornado, cluster w. IB

  - Green, cluster

  - Dayhoff. cluster

- Weather Forecast Production (SMHI*)

  - Bore (soon) cluster w. IB (HP)

  - Blixt, cluster w. IB

  - Bris, cluster w. SCI

- Weather Model Development (SMHI*)

  - Gimle (soon) cluster w. IB (HP)

  - Dunder. cluster w. IB

- SAAB AB

  - Darkstar, Maxwell, Hyperion, cluster

  - Navier, Hooke, SMP

*) SMHI = Swedish Meteorological and Hydrological Institute

HPC storage resources

Dedicated Disk Storage

- High Energy Physics

    - Serenity (LHC Tier-1), 56 TiB
      dCache

    - Tank (IceCube), 25 TiB
      dCache

- Climate Research

    - D&T storage
      Lustre

- @ SMHI

    - Research Projects
      XFS

    - Archive

Tape Storage

- Common for all resources

- Backup

- Hierarchical Storage

- IBM 3584

- TSM/HSM

- Currently: 85 Mfiles, 240 TiB

Network Infrastructure

- Current: Only gigabit switches. LiU backbone is routing all NSC traffic

- Coming: Redundant router structure

  - LAN connections to NSC resources at SMHI.

  - Direct connection from NSC to LiU border router.

 - Enable buildup of 10 Gb infrastructure

Neolith

- Largest academic HPC resource in Sweden
  60 TFlops peak, 44,5 TFlops Linpack, #23 on top500

- Computing: 6440 cores in 805 DL140g3

  - Intel Xeon Clovertown, 2.33 GHz

  - 725 with 16 GiB, 80 with 32 GiB, total 14 TiB

- Admin: 2 x DL380

- Access: 3 x DL380

- Network: Infiniband DDR, Full bisection + GigE + ILO

- Disk Storage:

  - 8 x DL380

  - 5 x Nexsan SataBeast (SATA) + 1 x IBM DS4700 (FC)

  - GPFS

I/O, system and access servers
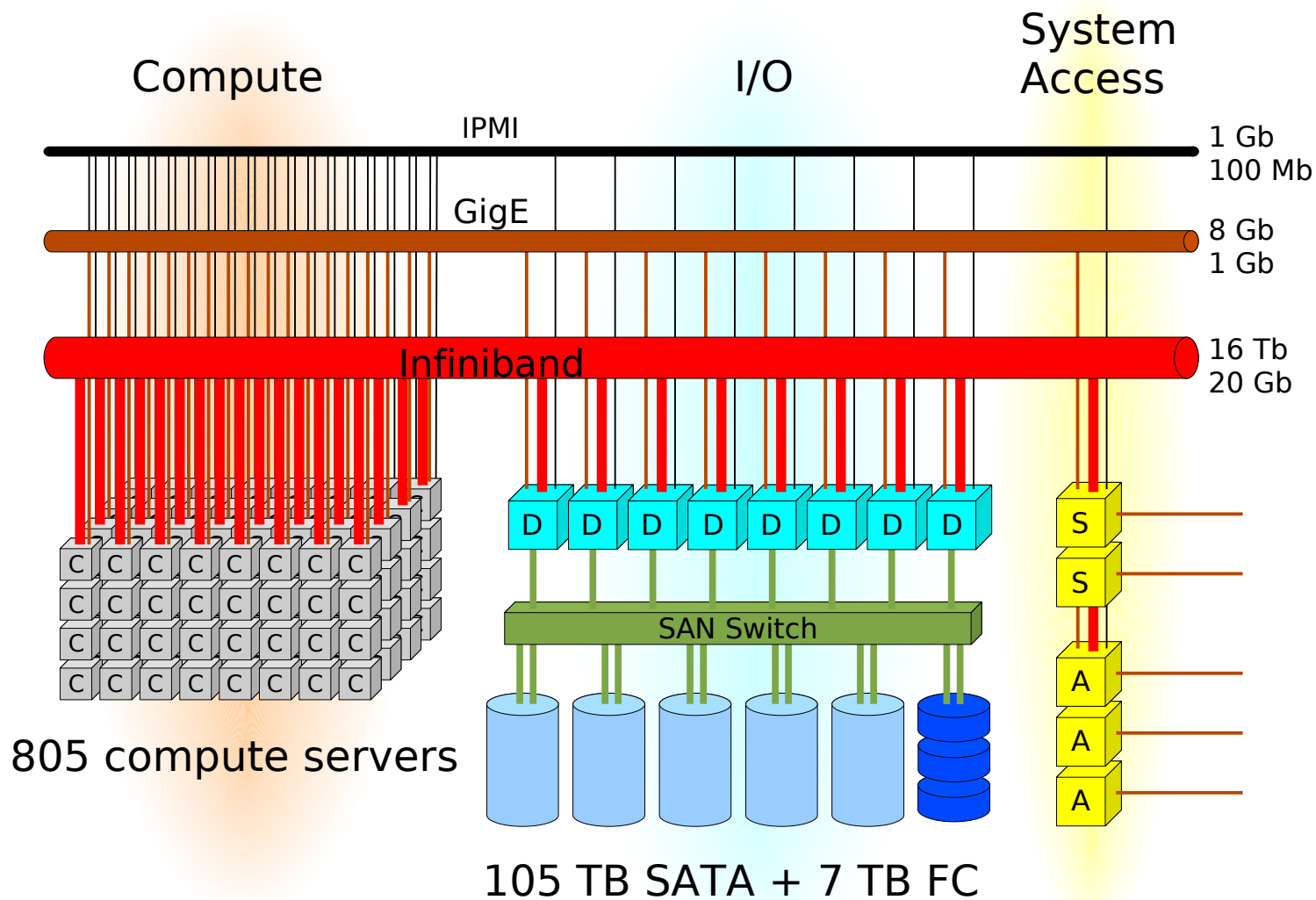
Double Data Rate Infiniband

- Fat tree topology

- Full bisection bandwidth

- 3 Core switches (288 ports)

- 68 + 1 Edge swiches (24 ports)

- 20 + 20 Gbit/s channel bandwidth
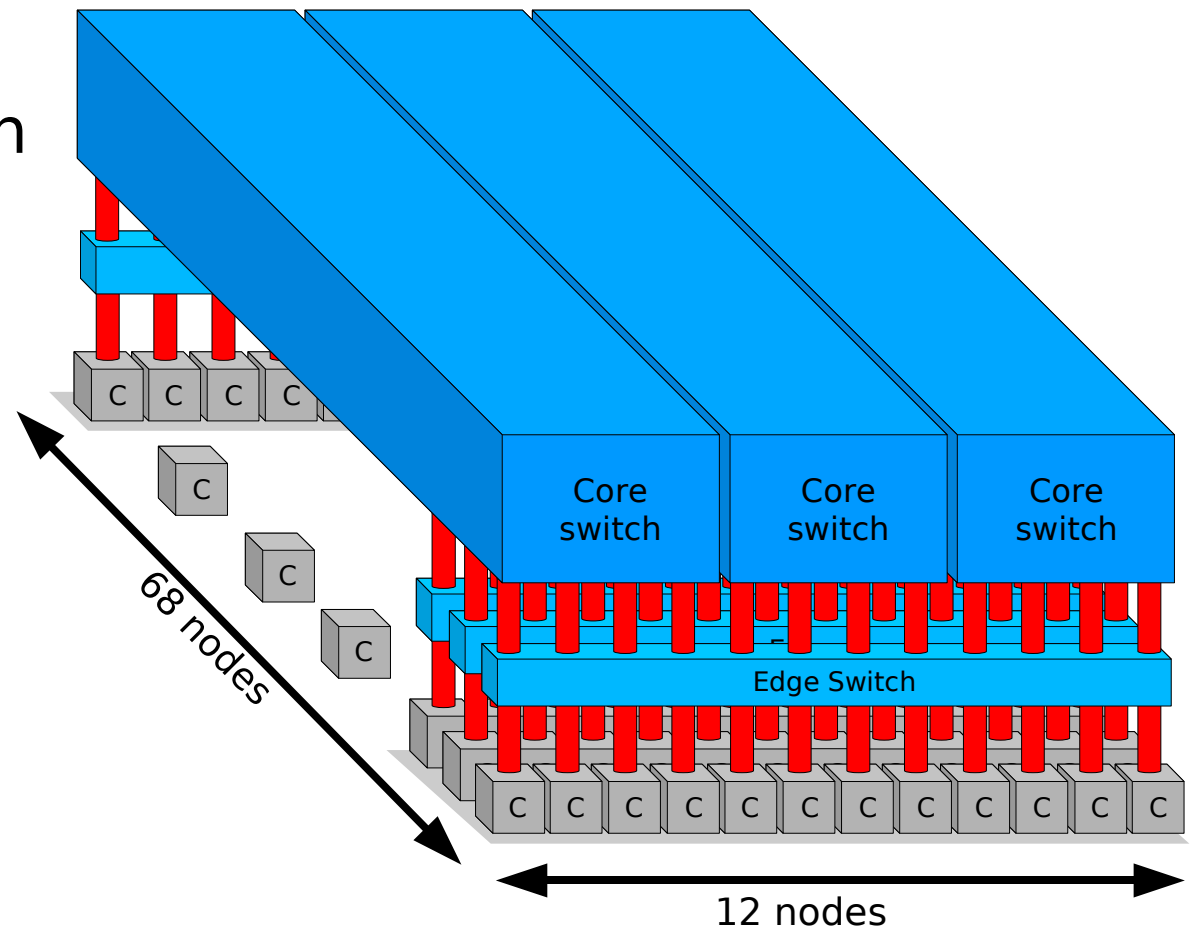
Bore / Gimle (to be installed soon)

- For national weather forecast production (Bore) and weather model development (Gimle)

- Computing: 1120 cores in 140 DL160g5

  - Intel Xeon Harpertown, E5462 (2.8 GHz)

  - 2.3 TiB memory

- Admin: 2 x DL380

- Access: 2 x DL380

- Network: Infiniband DDR, Full bisection + GigE + ILO

- Disk Storage (Bore):

  - 3 x DL380

  - 1 x Nexsan SataBeast

  - XFS

National Supercomputer Centre in Linköping Sweden

- 2 x Intel Xeon Clovertown Quadcore

- 64-bit architecture

- 2.33 GHz

- 4Flop/clock/core (using SSE3)

System Software

- OS: Linux

- Distribution: CentOS

- File system: GPFS

- MPI: Scali MPI, OpenMPI, HPMPI with some ISVs

- Compilers: Intel, GCC, PGI

- Math lib: Intel MKL

- Job Mgmt/Scheduler: Slurm/Moab

- Conf Mgmt: Systemimager, BitTorrent
  Full installation with each boot.

- Homegrown job start & compiler wrappers

Neolith current status

- Not entirely accepted yet

- Issues:

  - Memory ECC errors

  - Not all memory seen during POST

  - CMOS battery drainage

  - Lacking tools to update BIOS settings remotely

- Users on half of the system

Performance of NSC's fastest supercomputers