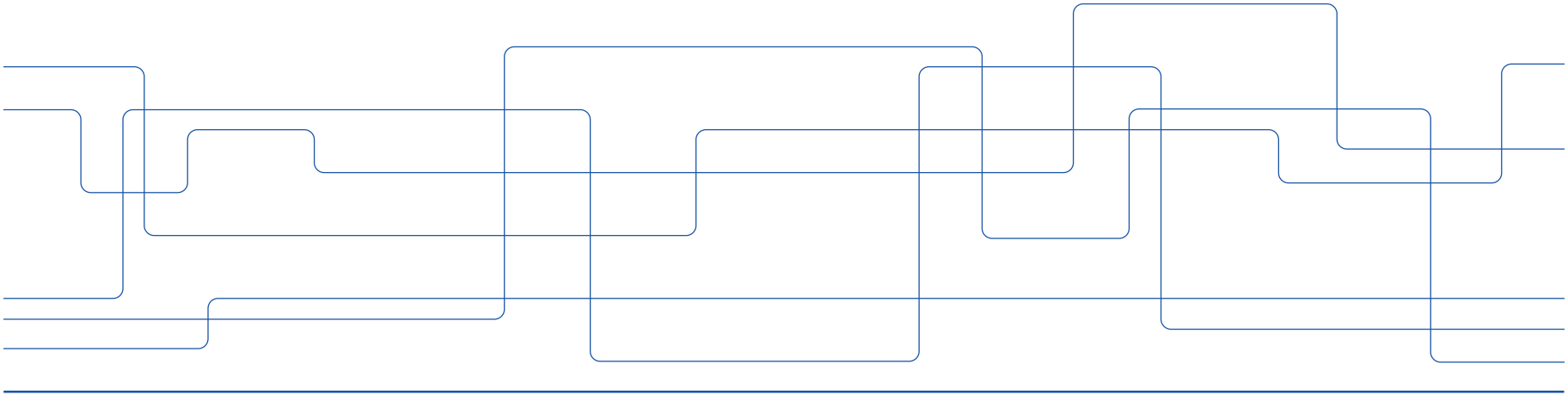
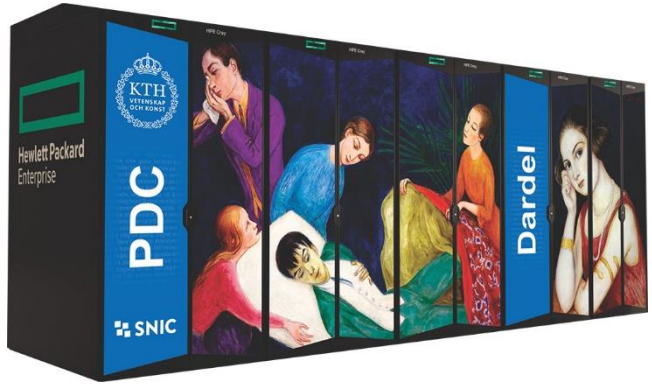
Welcome to the Dardel Phase 1 Inauguration

Dirk Pleiter

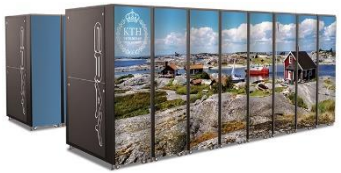


Dardel: A Next Step in 30 Years of PDC



Cray XE “Dardel” (2021)

Cray XT “Beskow” (2014)

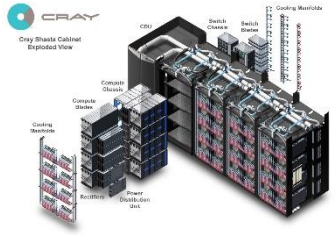


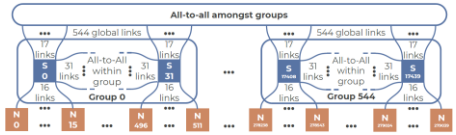
Cray XT “Lindgren” (2010)

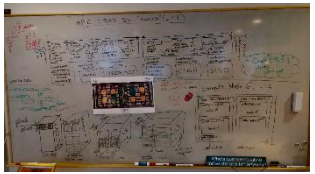
CM-200 “Bellman” (1991)

Dardel: Key Features

- Dense, compact and direct liquid-cooled design
- Highly innovative and scalable high-speed network
- Integration of powerful modern processor technologies
- Integration of next-generation compute accelerators
- Innovative and versatile software stack

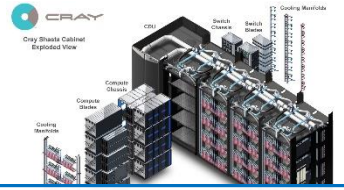




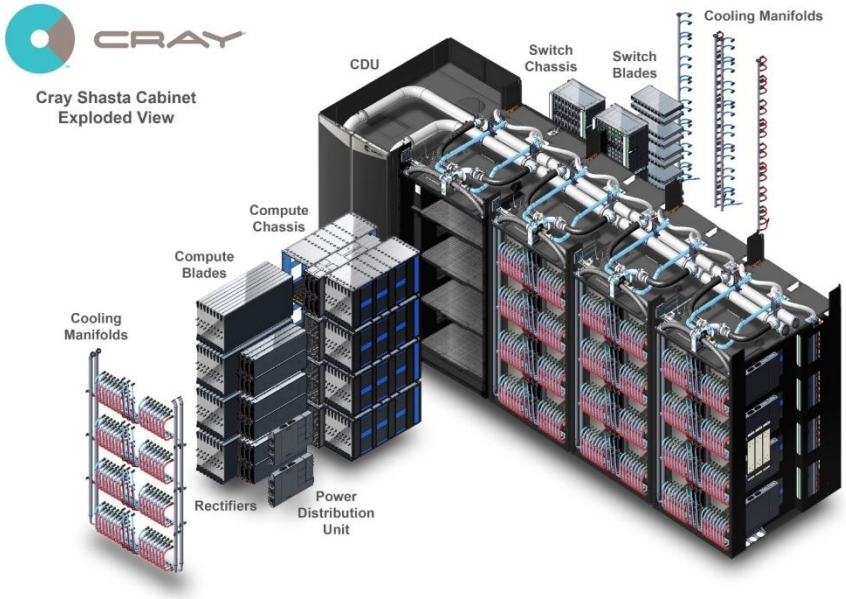


Dardel: Key Features

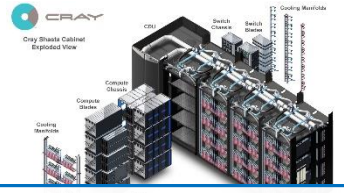
- Dense, compact a
- Highly innovative
- Integration of pow
- Integration of nex
- Innovative and ve



Dense, compact and direct liquid-cooled design



Dardel: Key Features



- Dense, compact a
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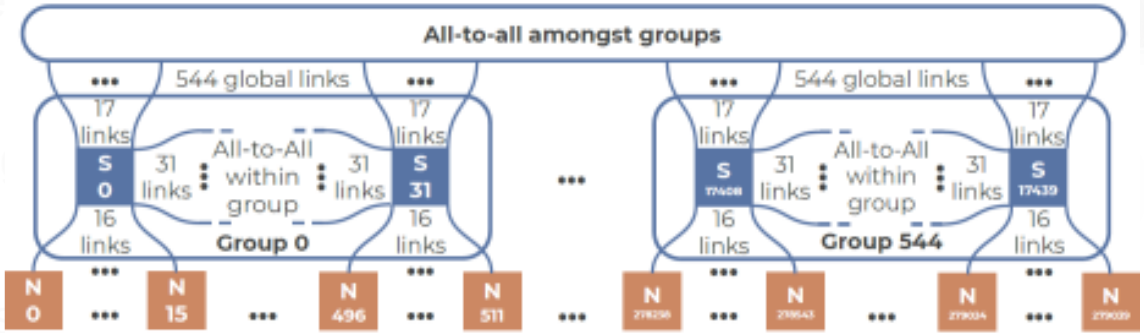
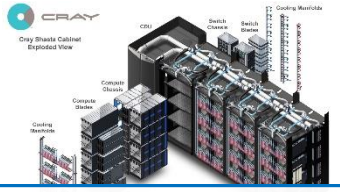
Highly innovative and scalable high-speed network

- Slingshot 200 Gbps network technology
- Dragonfly topology



Dardel: Key Features



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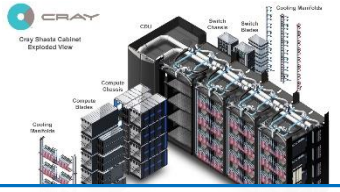
Integration of powerful modern processor technologies

- AMD EPYC Rome processors
- High core count (64 cores), large memory bandwidth

Dardel: Key Features

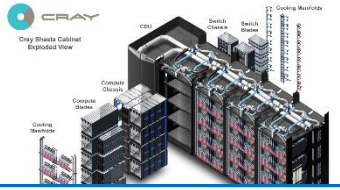


- Dense, compact and highly integrated hardware
- Highly innovative and scalable high-speed network
- Integration of powerful modern processor technologies
- Integration of next-generation compute accelerators (in Phase 2)
- Innovative and versatile software stack

Integration of next-generation compute accelerators (in Phase 2)

- AMD MI250x graphics processing units

Dardel: Key Features



- Dense, compact a
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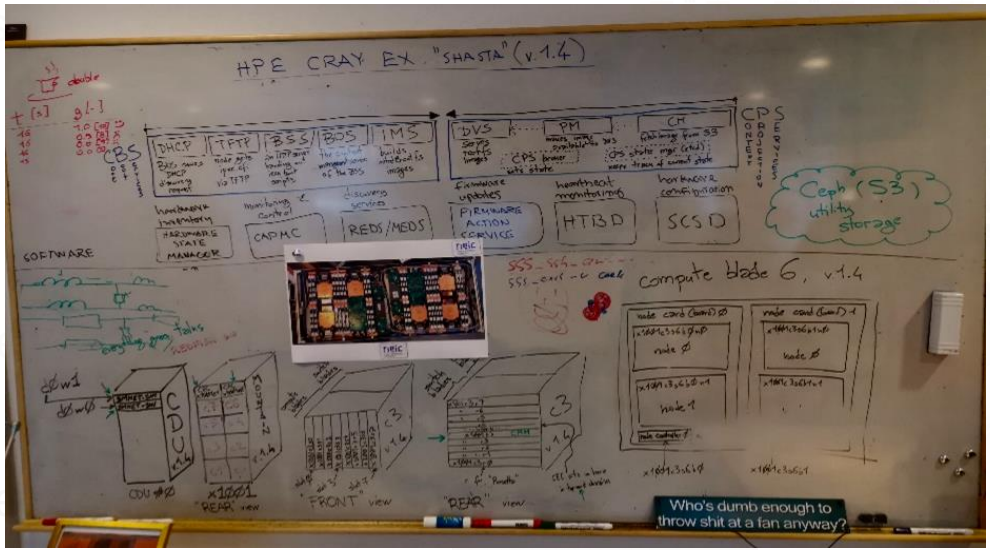
Innovative and versatile software stack

- With some complexities …



Dardel: Phase 1

- CPU-only nodes with >70,000 cores in different configurations
  - 524x Thin Compute Nodes with 256 GByte memory
  - 30x Large , Huge and Giant Compute Nodes with up to 2 TByte memory
- Ready to support various workloads
  - Examples:
    - *Scalable HPC simulations on many Thin Compute Nodes*
    - *Shared-memory data analytics on Giant Compute Nodes*
  - Rich software ecosystem using state-of-the-art deployment technologies
- High-performance parallel file system Klemming
- Excellent performance already in Phase 1
  - High-performance Linpack: 2.28 PFlop/s (91% of peak)
  - Improved power efficiency: ~6 GFlop/s/W (2.5x better than Beskow)
  - 180 GByte/s I/O bandwidth

Dardel: Phase 2 Outlook

- Target compute performance >13 PFlop/s
- Performance achieved by AMD MI250x Graphics Processing Units
  - 4 GPUs per node
  - Peak double-precision matrix performance per GPU: 95.7 TFlop/s

Getting Dardel in Place

Physical Integration

System integration and software deployment

```
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EasyBuild-user/4.5.0            gams/37.1.0      (D)    powerflow/6.2021R3      (D)
abaqus/2021                     llvm/13.0.0             rspt/20211004
amber/18.ambertools19           ls-dyna/13.0-dp         starccm+/16.04.007-dp
ansys-workbench/21.2            ls-dyna/13.0-sp  (D)    starccm+/16.04.007-sp   (D)
arm/21.1                        mathematica/13.0        telemac-mascaret/v7p1r0
cfx/21.2                        matlab/r2021b           uppasd/5.1.1
consol/5.6                      mpi4py/3.1.3-py38       vasp/5.4.4-vanilla
conveyor/3.0.23                 nest/2.20.2-py38        vasp/5.4.4-wannier90
dftd4/3.3.0                     nwchem/7.0.2            vasp/6.2.1-vanilla
elk/7.2.42                      openfoam/v2106          vasp/6.2.1-vtst-dftd4
espressomd/4.1.4                openfoam/7              vasp/6.2.1-wannier90    (D)
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Bison/3.7.5                              SpFFT/1.0.4-cpeCray-21.11
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Boost/1.77.0-python3-cpeGNU-21.11 (D)    buildtools/21.11
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CMake/3.20.1                             cpeAMD/21.11
CMake/3.21.2                     (D)     cpeCray/21.11
CubeLib/4.6-cpeGNU-21.11                 cpeGNU/21.11
CubeW/4.6-cpeGNU-21.11                   flex/2.6.4
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OTF2/2.3                                 nano/5.8
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SPLA/1.5.1-cpeAMD-21.11
```
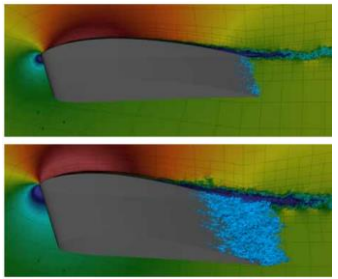

Early user access and user migration

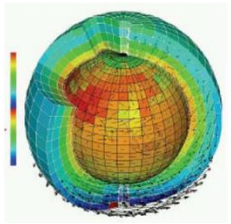
- 5 teams used Dardel during stability testing period in Autumn 2021



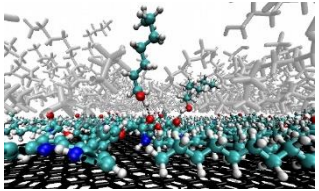
- >850 users are being migrated

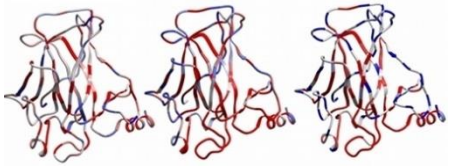
The Team Behind Dardel

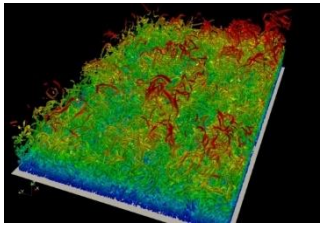
Dardel: A Science Instrument



- Dardel’s key performance indicator: new science
- Many exiting areas of research benefit from HPC
  - Fundamental sciences
  - Climate, weather, earth sciences
  - Future materials
  - Energy
  - Engineering, infrastructure, manufacturing
  - Life science, bio-informatics health, brain research
- Message to all researchers: Think BIG and apply for resources on Dardel







Thank You!