Mitglied der Helmholtz-Gemeinschaft

JÜLICH FORSCHUNGSZENTRUM

Lustre at JSC

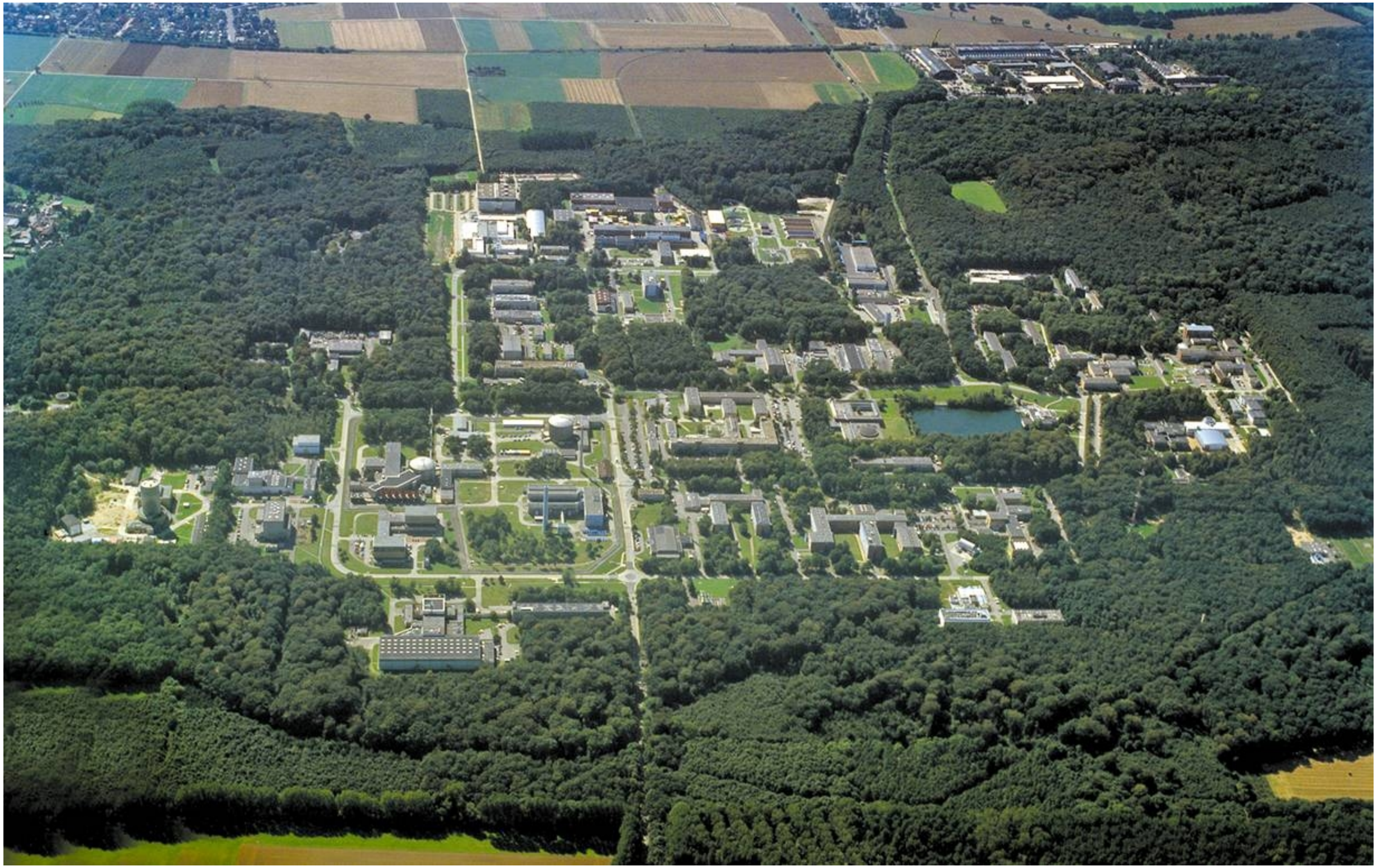
13 April 2011 | Frank Heckes

- ***Environment overview***
- ***Installation History***
- ***Monitoring***
- ***Perspectives***

Overview

- ***FZJ, National Research Center***
  - *Budget ~ 500 million €*
  - *~ 4600 employees*
  - *Areas:*
    Live science, energy technology, neurobiology, solid state / nuclear physics, climate/meterology, supercomputing

Overview



Overview

- ***JSC in nutshell***
  - *100 employees*
  - *2 Production Cluster*
    - *BlueGeneP - GPFS*
      First PRACE Tier-0 Center
    - *JuRoPA - Lustre*
      PRACE Tier-1 Center
  - *Two parallel FS in use: GPFS, Lustre*

Overview

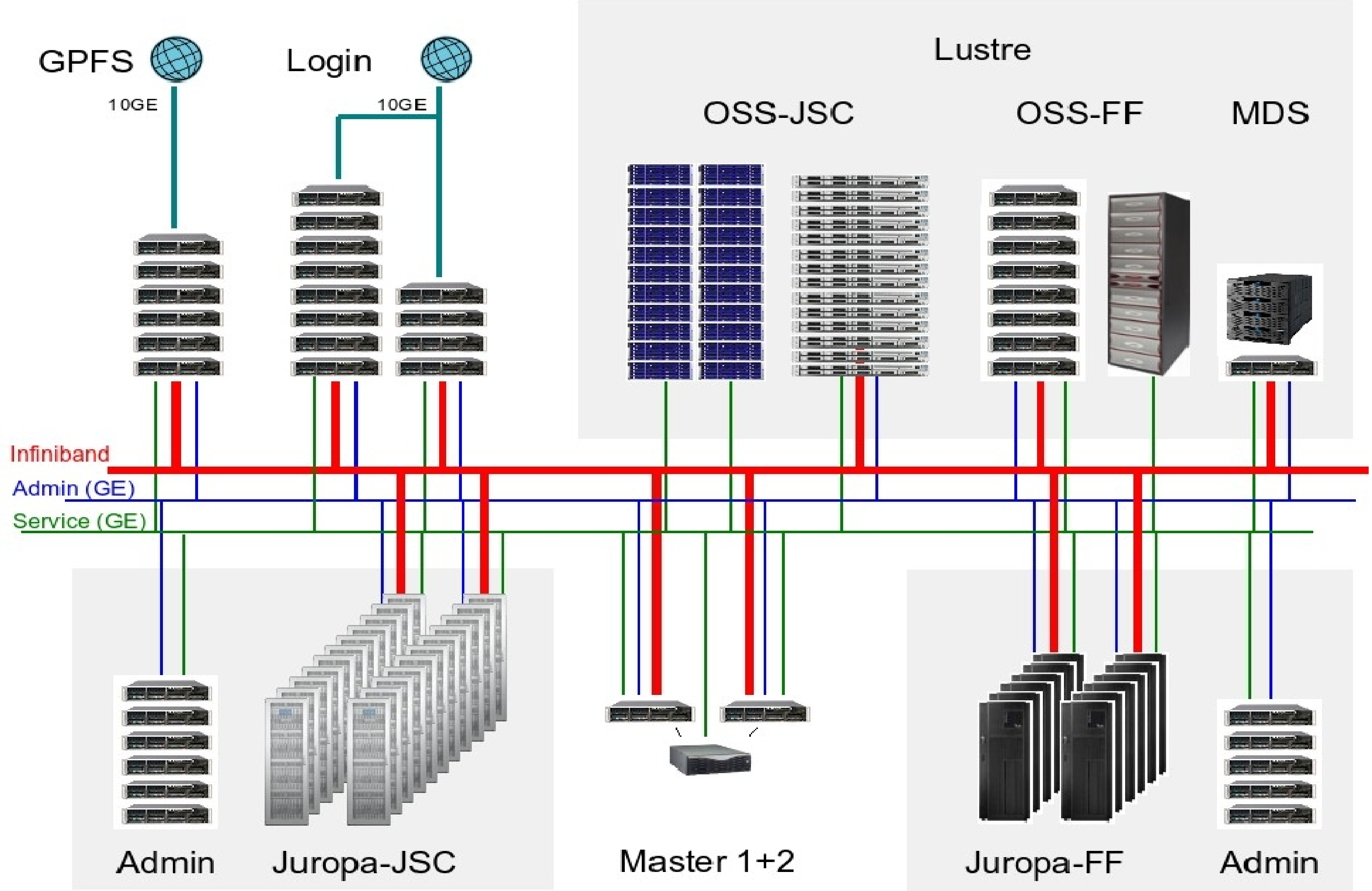
Overview

- ***JuRoPA Cluster***
  (Jülich Research on Petaflop Architectures)
- ***Involved Companies***

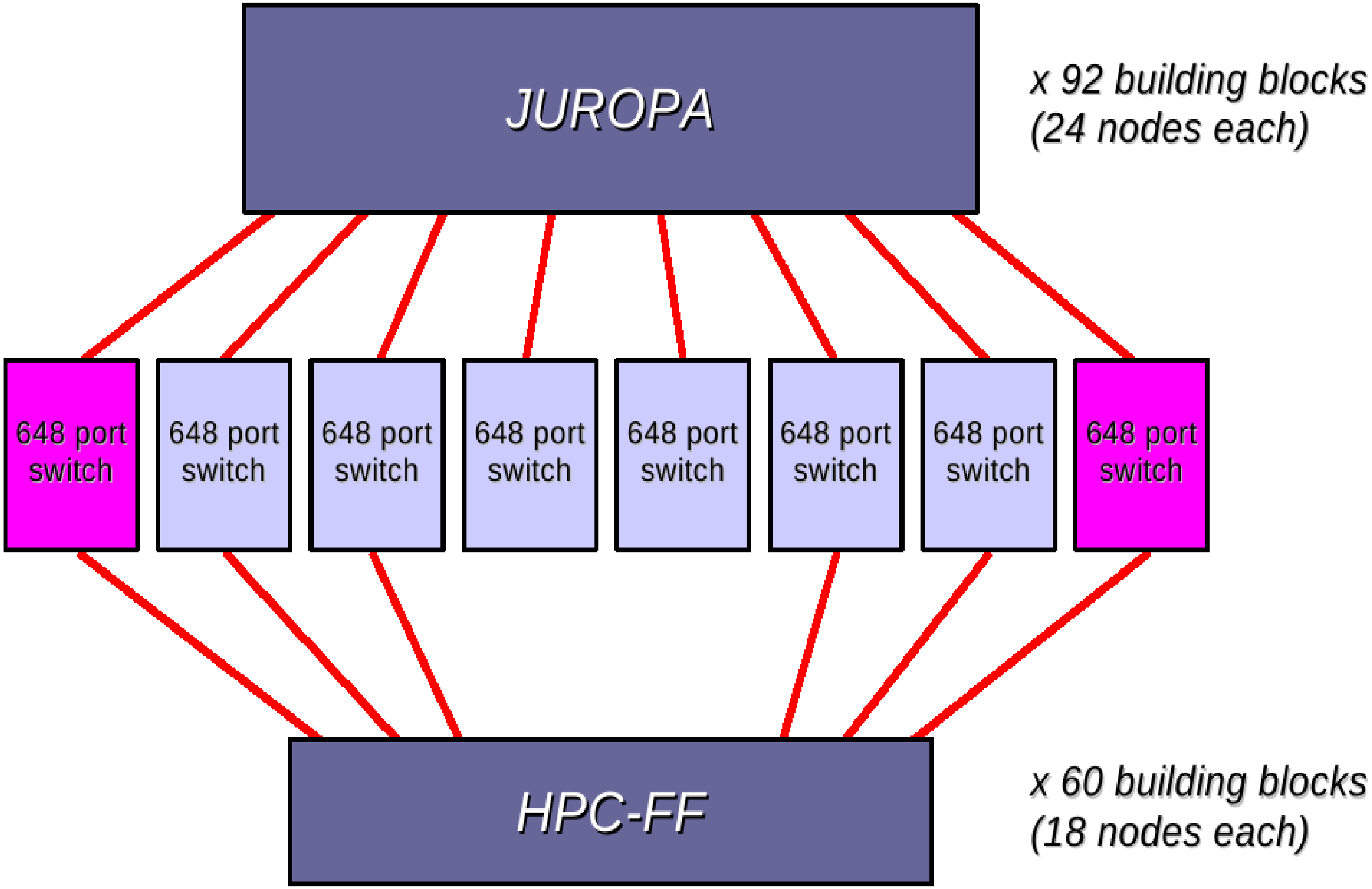
Bull, Sun (Oracle), Mellanox, Intel, ParTec, Novell

- ***Two parts***
  - *European fusion community (1/3)*
  - *JSC (2/3)*
  - *Can act as 'one' cluster*
- ***Heterogenous user community***
- ***High utilisation (~ 95 %)***
- ***Life span till 2013/2014***

JuRoPA Architecture



Infiniband topology



Overview

- ***Operating System***
  - *Compute nodes : SLES 11 SP1*
  - *Lustre server : SLES 11*
- ***Compute Component:***
  - *3288 compute nodes (26304 cores)*
    2 Intel Xeon X5570 (Nehalem-EP) quad-core processors @ 2.93 GHz
  - *79 TB main memory*
  - *308 Teraflops peak performance*
  - *274.8 Teraflops Linpack performance*
    - *No. 10 in TOP500 list June 2009*
    - *No. 23 in TOP500 list Nov. 2010*

Overview

- ***FS component***
  - *HOME*
    - *7 x snowbird system*
    - *Building block: 2x Sun Fire X4170 + 4 x J4400 JBODs*
    - *2 HOME FS, each ~ 29 TB, bandwidth 1GB/s*
      Size adapt to backup/restore bandwidth
    - *Total capacity: ~ 400 TB*
  - *Under construction*
    - *2 x DDN SFA 10000 + 8 OSS*
    - *Building block: 1 x SFA 10k + 4 Bull RS 423 nodes*
    - *Planned capacity / FS: ~ 24 TB*
    - *Total capacity: ~ 770 TB*

Overview

- ***FS component***
  - *SCRATCH*
    - *2 x SFA 10000 + 8 OSS nodes*
    - *Building block: 1 x SFA 10000 + 4 x Bull Novascale 423*
    - *~ 800 TB, bandwidth 19 GB/s*
  - *MDS*
    - *2 x Emc CX-240 + 4 MDS(MGS) nodes*
    - *Building block: 1 x Emc CX + 2 Bull Novascale 423*

Installation History

- ***Start with 1.8.0 GA***
  - *Massive errors*
    - *3 corrupted filesystem*
    - *Many OSS, MDS crashes*
  - *Very sensitive to IB errors*
- ***Lustre 1.8.1.1 + patches (SLES 11)***
  - *version is stable, but very sensitive to IB and HW errors*
  - *OSS, MDS crashes*
  - *Large downtime (2 weeks) due defective MPT (SAS) driver*

Installation History

- ***Lustre 1.8.4***
  - *stable version*
  - *Improved performance*
  - *More robust to IB errors*
  - *Fragmented I/O*
    - *Many iops not aligned to 1M blocks*
  - *Local flock feature enabled*

Monitoring

- ***Functionality***
  - *Framework to execute bespoke scripts and programs*
    - *State of disk, FC- connection, mounts, ..., Temperature,...NTP, DNS,...*
  - *Not scalable, but sufficient for current infrastructure*

- ***Performance***
  - *Measurement with `collectl`, `sysstat`, '`cat /proc...`'*

currently on demand evaluation

  - *Latencies in RAID devices*

Perspective

- ***Unclear support situation***
  - *Lustre support at Oracle??*
  - *New version after 1.8.5; bug fixes?*
- ***Improve backup procedure***
  - *Use meta info for backup list*
- ***HSM support***
  - *Integration of Lustre filesystems in Tivoli Storage Manager*
- ***End-to-End data integrity***

Perspective

- ***Lustre 2.x Upgrade***
  - *unclear*
  - *Cooperation originally planneed with SUN; canceled by ORACLE*
  - *OSS/OST resources for datamigration already allocoated, due to delays*
- ***Improve knowledge***
  - *Gap between SysAdmin – Developer*
  - *Lustre Internal Training needed*
  - *Plan is to contribute to Lustre 2.1++*

Perspective

- ***FZJ / JSC is Initiator and Founding Member of EOFS (European Open File System)***

Questions?