HPC Infrastructure at LNU: A Computer Scientist's View

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My Experience at the Research Group Scientific Computing, University of Vienna (AT)

2002 — Extension of UML for performance modeling of parallel and distributed programs. <<UML 2002>>

2004 — Extension of UML for Grid workflow applications. AxGrids 2004

2006 — High-level Specification of QoS-aware Grid Workflows. Scientific Programming Journal, 2006

2008 — Automatic performance model transformation from UML to C++. ICPP 2008

2009 — Hybrid performance modeling and prediction of large-scale parallel systems. Book chapter, IOS Press book series "Advances in Parallel Computing", 2009

2012 — Platform Description Language for heterogeneous computing systems. Parallel Computing Journal, 2012

Gescher Cluster (80 processors), a subcluster of single CPU nodes, a subcluster of 4xCPU SMP nodes

Grid Computing Systems Picture: courtesy of the DataGrid Project

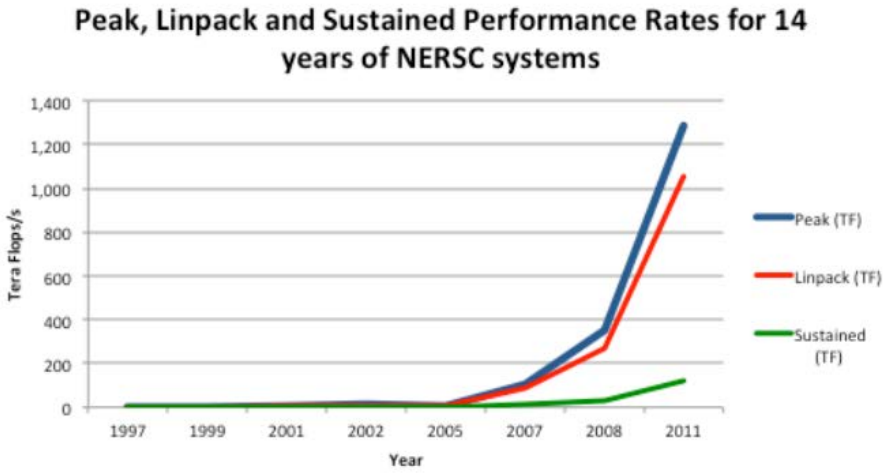
Luna Multi-core Cluster, Dual-Core AMD Opterons, (288 processor cores)

Celline, 1xLS22 & 4xQS22 (2xQuadCoreOpteron & 8xPowerXCell8i)

Cora, two quad-core CPUs and three GPUs (2x C2050 and 1x C1060)

HPC-Relevant Research at the Computer Science Department, LNU (SE)

- **Software engineering**
  - SW tools and libraries
  - performance modeling, evaluation, optimization
- **Big Data**
  - stream processing
- **Interactive web-based visualization**
  - computationally demanding operations performed on server



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National Center for Supercomputing Applications
University of Illinois

NERSC: National Energy Research Scientific Computing Center (Oakland, CA, USA)

System Requirements of the CS Department

- **Software engineering and Big Data**
  - shared system
  - 256 GB -- 1 TB primary memory (RAM)
  - 8 -- 64 CPUs with 16 cores (128 -- 1024 cores)
  - hardware transactional memory (optional)

- **Interactive visualization**
  - dedicated system
  - 2 state-of-the-art CPUs (12 -- 18 cores)
  - 256 GB -- 512 GB primary memory
  - 8 TB secondary memory (preferable SSD)

LNU HPC Center: Organizational Aspects

- **LNU HPC Center**
  - such a unit would need adequate staff
  - HPC scientists
  - system administrators
- **Center at FTK level**
  - financing the center could be challenging for FTK alone
- **Center at LNU level**
  - costs of the center would constitute a smaller fraction of the overall LNU budget
- **Center as a new organizational unit co-financed by FTK and FHL**
  - example is the eHealth institute at LNU

LNU HPC Center: Opportunities

- **Combine internal and external funding**
  - VR, Wallenberg, SSF,..
  - co-financing by industry (Volvo, SAAB,..)

- **Availability of the advanced computing infrastructure creates new opportunities**
  - will make easier for LNU scientists to attract external funding
  - ”meeting-point” for multidisciplinary projects (CS, physics, life sciences,..)

- **Measure of success**
  - publications
  - external funding

Example: HPCViz at KTH

- **Department of High Performance Computing and Visualization (HPCViz)**
  - PDC: Center for High Performance Computing
  - CTL: Computational Technology Laboratory
  - VIC: Visualization, Interaction and Collaboration

- **Supercomputer Beskow (Cray XC40)**
  - about 2 petaflops of peak performance
  - 53632 cores
  - 1st in the Nordic countries
  - 32nd in the current Top 500 list
  - used since January 2015
  - budget for four years: 170 million SEK

Supercomputer Beskow at PDC

Thank you for your attention!