Research Group Scientific Computing

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Faculty of Computer Science

University of Vienna

http://www.par.univie.ac.at

Organization and Staff

One of 9 research groups at the Faculty of Computer Science

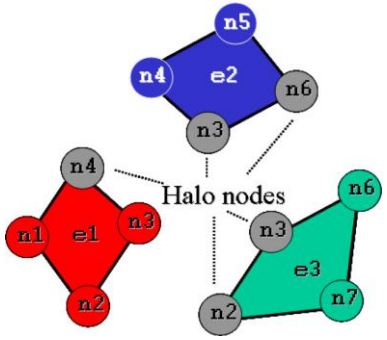
Staff

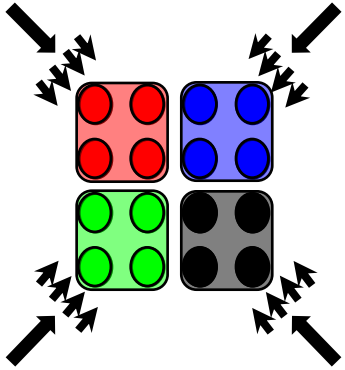
- 5 Faculty
- 12 Research
- 3 Admin/Support

Research Areas

Parallel Computing / HPC

- Programming Models and Languages
- Compiler and Runtime Technologies
- Programming Environments and Tools





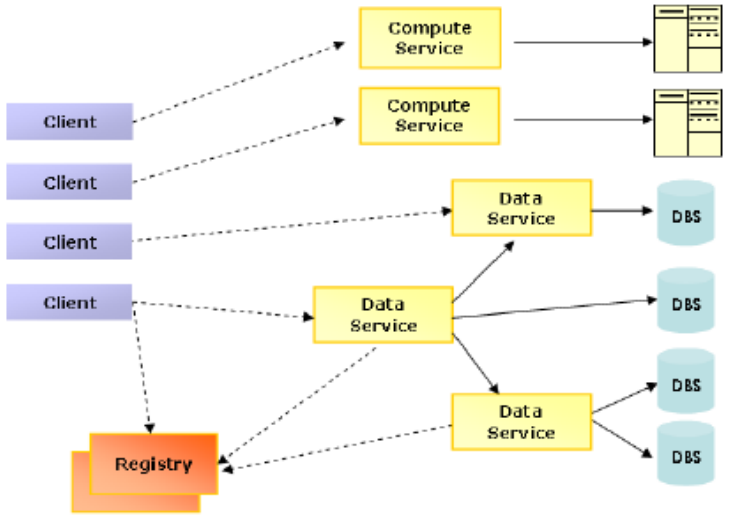
Vienna Fortran, HPF, HPF+, Hybrid Programming, Multicore…

Book: P. Brezany. Input-Output Intensive Massively Parallel Computing, Springer 1997.

Grid/Cloud Computing

- Compute and Data Services
- Data-Intensive Research
- Large-Scale Data Integration & Mining

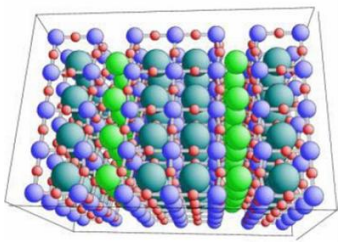
Vienna Grid Environment, Grid/CloudMiner, Vienna Cloud Environment, …

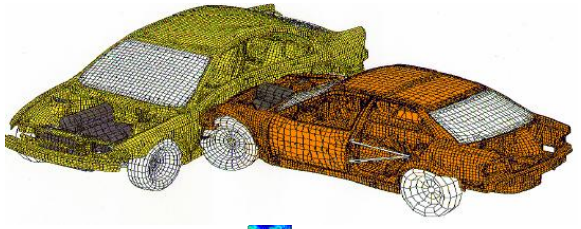


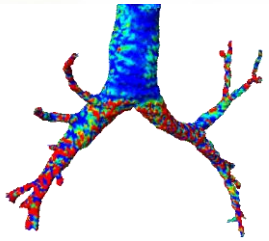
Research Group Scientific Computing

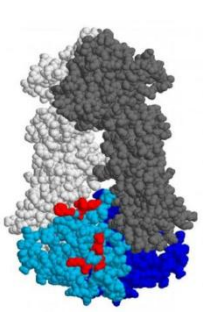
Application-oriented Research

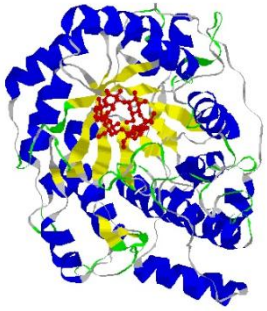
- Crash Simulation
- Engine Design Opt.
- Weather Prediction
- Material Sciences
- Financial Optimization
- Biomedical Simulations
- Ambient Assisted Living
- Traditional Chinese Medicine
- Breath Gas Analysis
- Traumatic Brain Injury











Past Research Projects (selected)

Past Projects

- **CEI-PACT**, Project of the Central European Initiative, 93-96
- **HPF+**, Optimizing HPF for Advanced Industrial Applications, EU, 96-98
- **SFB AURORA**, Project 2 - Languages, Compilers and Runtime Systems for Scientific Computing, FWF, 97-07
- **GEMSS**, Grid-enabled Medical Simulation Services, EU FP5, 02-05
- **Austrian Grid**, Austrian Government, 05-11
- **GridMiner**, Modern Data Analysis on Computational Grids, FWF, 03-06
- **@neurIST**, Integrated Biomedical Informatics, EU FP6, 2006-2010
- **ADMIRE**, Advanced Data Mining and Integration Research for Europe, EU FP 7, 2008-2011

Funded Research Projects

Current Projects (see www.par.univie.ac.at)

- **PEPPHER**, Performance Portability and Programmability for Heterogeneous Many-core Architectures
  European Commission, FP7, 2010-2012, **Coordinator**

- **VPH-SHARE**, Virtual Physiological Human - Structured HumAn physiological Research Environment,
  European Commission, FP7, 2011-2015

- **ABA** - Dataspace-Based Platform for Breath Gas Analysis,
  Austrian Science Fund, FWF, 2010-2013 , **Coordinator**

- **SPES** - Support Patients through E-services Solutions,
  European Commission CEP, 2011-2014

- **AutoTune** - Automatic Online Tuning, European Commission, FP7, 2011-2014

Research Infrastructure

- SUN X4100 Cluster, 288 processor cores, Infiniband
- IBM BladeCenter QS22/LS22

  (8x PowerXCell 8i, 2x Opteron), 80 cores
- SUN X4500, 4 cores, 24 TB disk
- GPU Cluster, 16x Nehalem X5550, 16x NVIDIA C1060,

  16x NVIDIA C2050 (Fermi), 60 TB disk
- Intel SCC (remote access)
- Intel Nehalem EX, 4x8 cores, 64 GB RAM
- SUN T3, 2x16 cores, 256 Threads
- Intel MIC (KNF, KNC)

EU Project ADMIRE

Advance **D**ata **M**ining and **I**ntegration

Research for **E**urope

Goals: to create and demonstrate a single platform for knowledge discovery, combining data access, integration, pre-processing, data mining, statistical analysis, post-processing, transformation and delivery.

The ADMIRE platform features

- DISPEL, a powerful, Java-like language for describing complex data-intensive workflows.
- A streaming execution engine.
- Rich semantic descriptions of workflow elements based on a common network of ontologies.
- A library of 150+ standard workflow elements for accessing, integrating, transforming and moving data.
- Visual programming tools based on the Eclipse platform.

EU Project SPES

Support Patients through E-Service Solutions

SPES project implements tele-health platforms in 4 cities:

- Ferrara (Italy),
- Vienna (Austria),
- Brno (Czech Republic), and
- Kosice (Slovak Republic)

focusing on the following diseases:

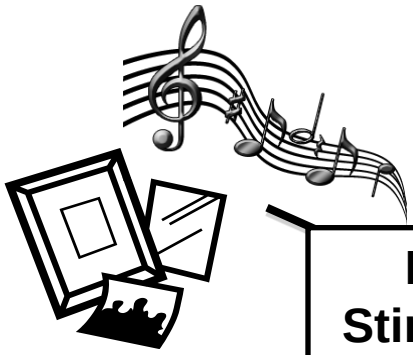
- respiratory problems (Ferrara),
- **dementia** (Vienna),
- handicapped people (Brno), and
- social exclusion (Kosice).

The aim is to contribute to a greater social cohesion in the Central Europe area.

SUPPORT PATIENTS THROUGH E-SERVICE SOLUTIONS

www.spes-project.eu

Vienna Appl. Use Cases



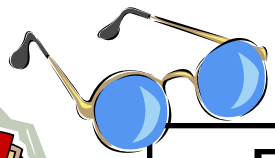
Brain Stimulation

Orientation Support

Persons with dementia

Take me along!

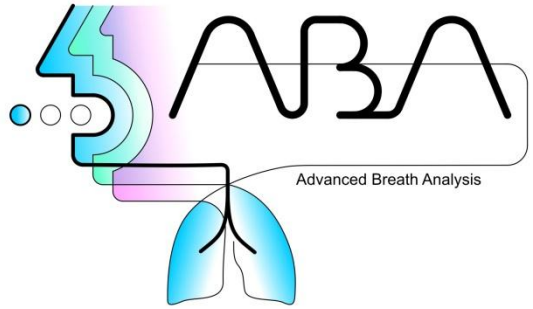
Talking Key



Finding Things again

Preventing dangerous Situations

Austrian Project ABA



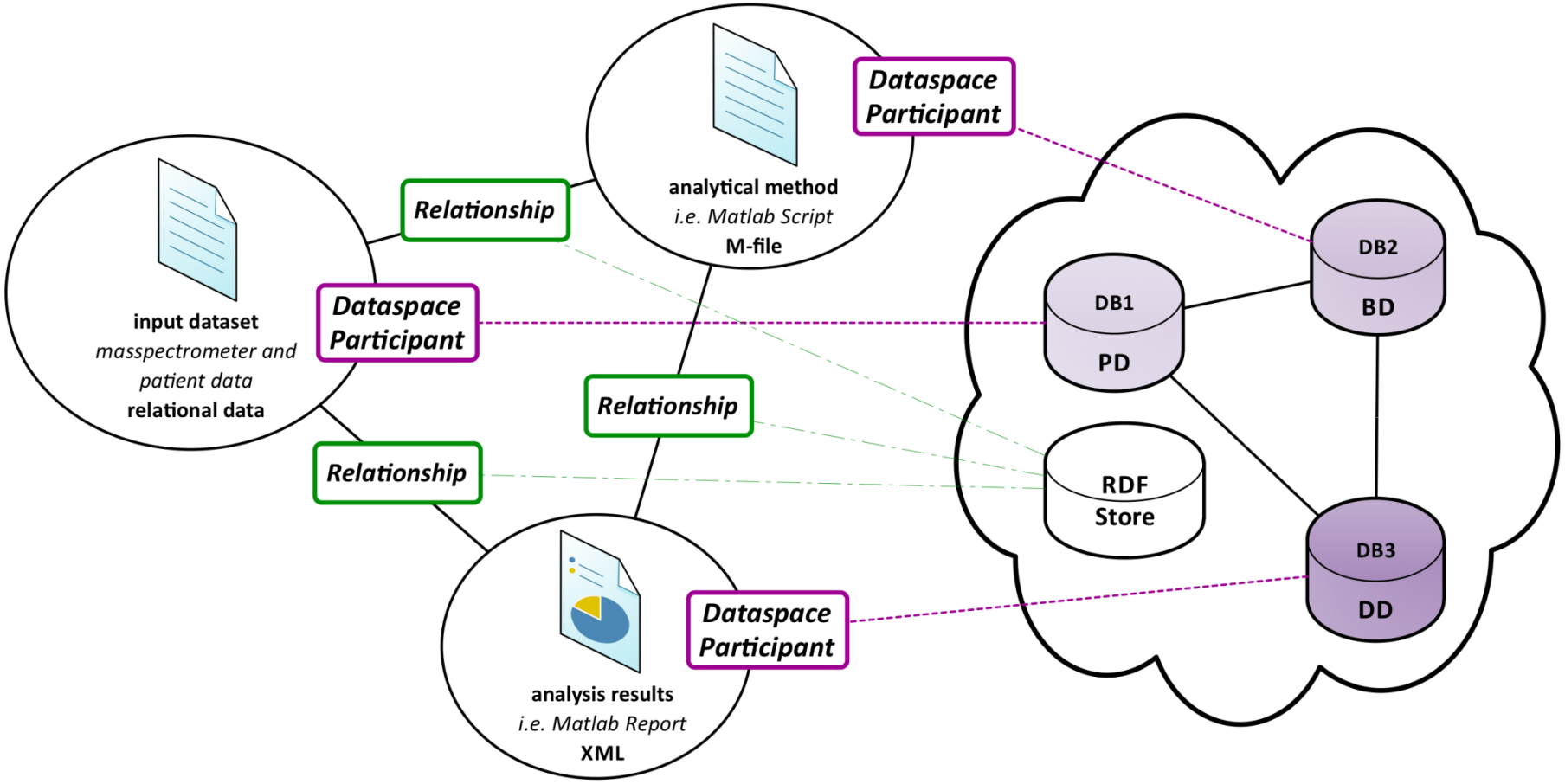
Dataspace-Based Platform for Advanced Breath Gas Analysis

The breath gas analysis scientific community is continuously developing new analytical methods and collecting pilot data, for instance to identify marker compounds for various diseases.

In this context, it is of particular importance for collaborating scientists and institutions to get access to distributed data and analytical resources collected at different research institutions.

We investigate a novel data management paradigm called **dataspace** in conjunction with scientific workflow management and its automatic parameterization. This will provide a highly efficient and powerful scientific data management and analysis platform for the breath gas research community and other applications.

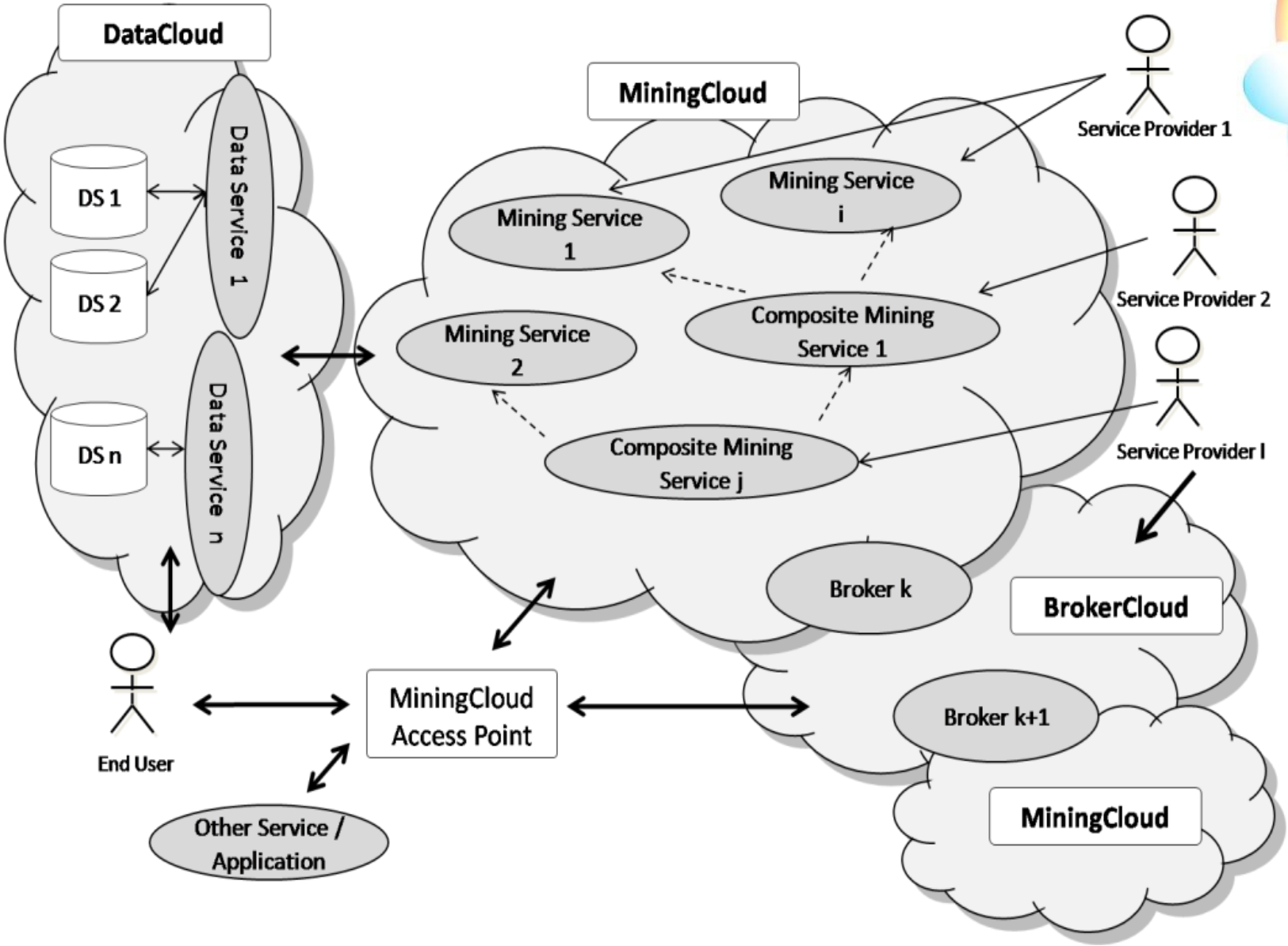
ABA Dataspace Concepts



(a) breath gas experiment

(b) Scientific dataspace

CloudMiner


DataCloud
DS 1
DS 2
DS n
Data Service 1
Data Service n
MiningCloud
Mining Service 1
Mining Service i
Mining Service 2
Composite Mining Service 1
Composite Mining Service j
Service Provider 1
Service Provider 2
Service Provider l
Broker k
BrokerCloud
Broker k+1
MiningCloud
End User
MiningCloud Access Point
Other Service / Application

Thank you for your attention!