Scalable Scientific Data Processing

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Data Analysis

- exploits massive parallelism
- supports handling of structured data
- based on Cloud technology

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Data Management

- scalable, decentralised approach
- supports community-specific access patterns
- based on DHT systems

Data Management: HiSbase

Goal: Scalable storage and retrieval for scientific data sets

- combines globally distributed data sources
- data load balancing by partitioning
- support for community specific data access patterns
  - e.g., preserve spacial locality for observational catalogues
- query load balancing through replication
- uses P2P techniques (DHT, key-based routing)

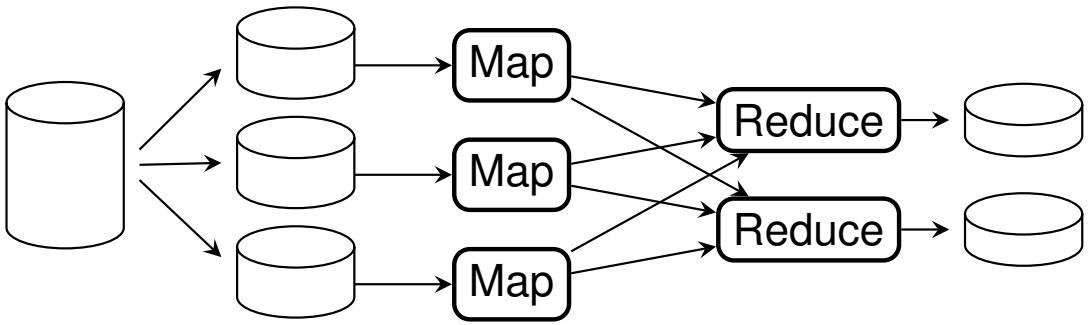
Data Analysis

Goal: Fast and easy analysis of scientific data sets

- scientific data sets
  - large scale (TBs per catalogue/simulation)
  - possibly structured data (e.g. Millennium merger trees)
- fast analysis
  - massive parallelism
  - scalable infrastructure
- easy analysis
  - high level scripting language
  - hide technical details

Data Analysis: Based on MapReduce

- proposed by Google for processing very large data sets
- one data set
- two processing steps
- file based data exchange via full mesh
- transparent handling of infrastructure failures



Data Analysis: Pipelined MapReduce

- permits more than two processing steps
- pipelined data exchange via full mesh, broadcast, or 1:1
- allows to process multiple data sets

$\Rightarrow$ more flexibility for sophisticated workflows

Data Analysis: Based on PigLatin

- scripting language for MapReduce jobs
- offers data processing primitives
  - projection
  - selection
  - grouping
  - aggregation
  - (equi)join
- automatically compiled to a sequence of MapReduce tasks

Data Analysis: TreeLatin

- extends PigLatin to handle hierarchical data sets
- translates to workflows for Pipelined MapReduce
- uses database optimisation techniques
  - pushing selections and projections
  - early aggregation
  - different join algorithms

Get In Touch

- Database systems group, TU München
  - web: http://www-db.in.tum.de/
  - eMail: gufler@in.tum.de
- Cloud data analysis project
  - http://www-db.in.tum.de/research/projects/cdm
- HiSbase project
  - http://www-db.in.tum.de/research/projects/hisbase
- GAVO
  - http://www.g-vo.org

Thank You for Your Attention