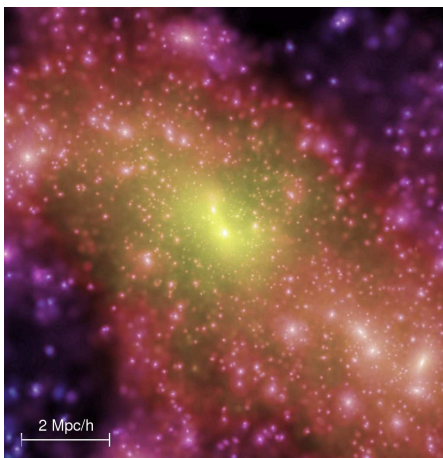


## AstroGrid-D: Supporting e-Science and Grid middleware in German Astronomy

### Scientific Applications

- **Extensive parameter studies, simulations and postprocessing** (including visualisation) of simulation results of astrophysical problems ranging from stellar magneto-hydro-dynamics to collisions of galaxies or black holes to structure formation of the universe
- **Processing observational data with specialized pipelines and sophisticated workflow managers** to build astronomical catalogs, crossmatching and data mining catalogs from data archives to extract new scientific information
- **Coordinating robotic telescopes for event-triggered observations** and longterm studies of astronomical objects independent of the 24h cycle



Millennium Simulation: Dark Matter Distribution

### Requirements

- execution of complex workflows
- steering and migration capabilities for huge simulations
- very large volumes of input and output data (> 1 TB)
- handling requests for specialized hardware (GRAPE)
- management of distributed data sets
- interfacing with Virtual Observatory tools
- event-triggered observation scheduling



STELLA I+II: Robotic Telescopes on Tenerife

### New challenges

Grid enabling robotic telescopes presents new challenges for job scheduling, job brokering and dynamic resource metadata:

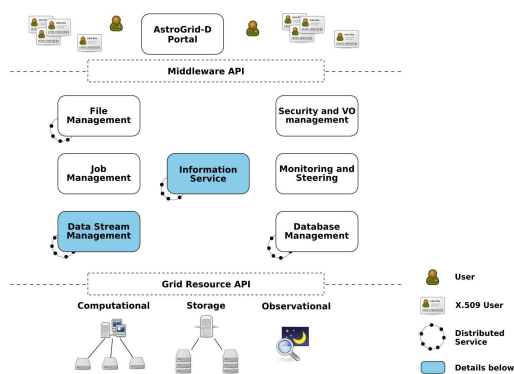
- from manual scheduling to automatic scheduling
- support for co-scheduling of more than one telescope
- weather dependency of observations
- support for RTML and metadata description of robotic telescopes

### Architecture

The high-level services produced in AstroGrid-D will be under an **Open Source** license and use **Globus Toolkit 4** and **UNICORE** for resource abstraction.

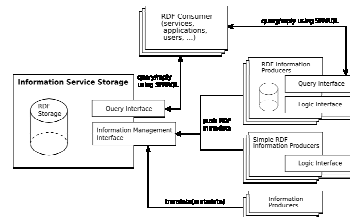
#### Service functionality

- scalable and extensible information service
- transparent access to replicated data sets
- efficient database access and stream processing through pipelining
- meta job-scheduling and brokering
- X.509-based security and Virtual Organization management
- application specific monitoring and steering



### Information service

- flexible just-in-time schemes by using RDF (Resource Description Framework)
- mechanisms for access restriction
- garbage collection with entry lifetime
- natural context-based partitioning of metadata
- query with SPARQL



### Data Stream Management

- publish and subscribe to sensor streams
- query shipping instead of data shipping
- intelligent in-network query processing
- data stream sharing
- early filtering of sensor streams
- integrating sensor streams and persistent data
- streaming workflows on the grid

