

Celebrating **20** Years of Innovative Computing
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Practical Application Study on GridRPC and Data-Intensive Computing Research

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When I stayed in ICL

- 2003.1 ~ 2003.9
- Ph.D student of Doshisha University in Japan
 - My supervisor was Tomoyuki Hiroyasu.
- Attended the NetSolve meeting
 - Application development using NetSolve
 - Learned a way of such middleware development
 - Middleware development using Globus
 - Study for the grid scheduler
- I received a Ph.D. degree in March, 2004 and started working in AIST.

To make GridRPC practicable

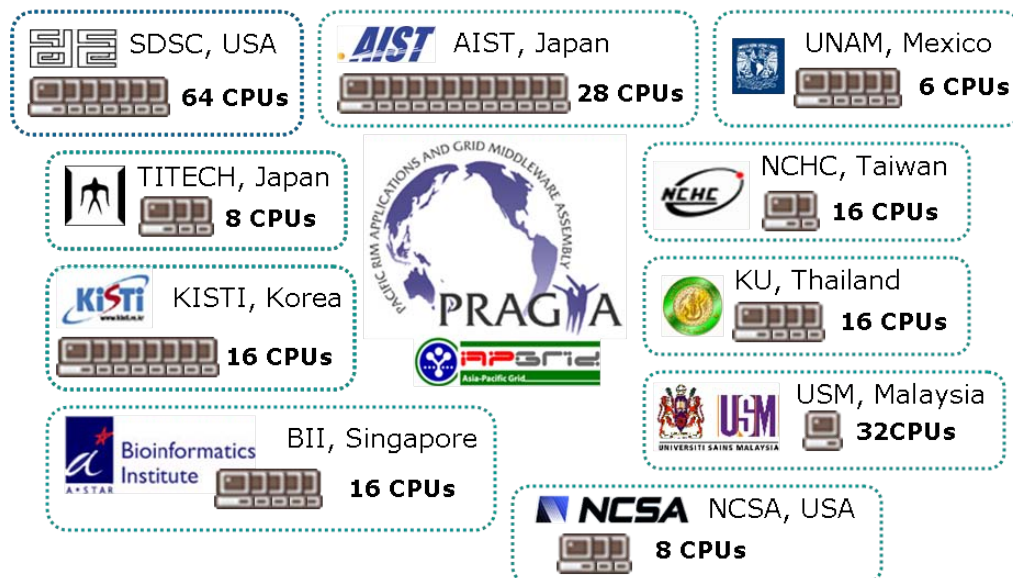
- Joined the Ninf team in AIST
 - Ninf is another GridRPC implementation.
 - A strong aim for making it production quality in the practical Grid environment
 - Dependency to Globus (at that time)
 - Had long-run and scalability experiments

Long-running experiment (multiple runs during 3 months)

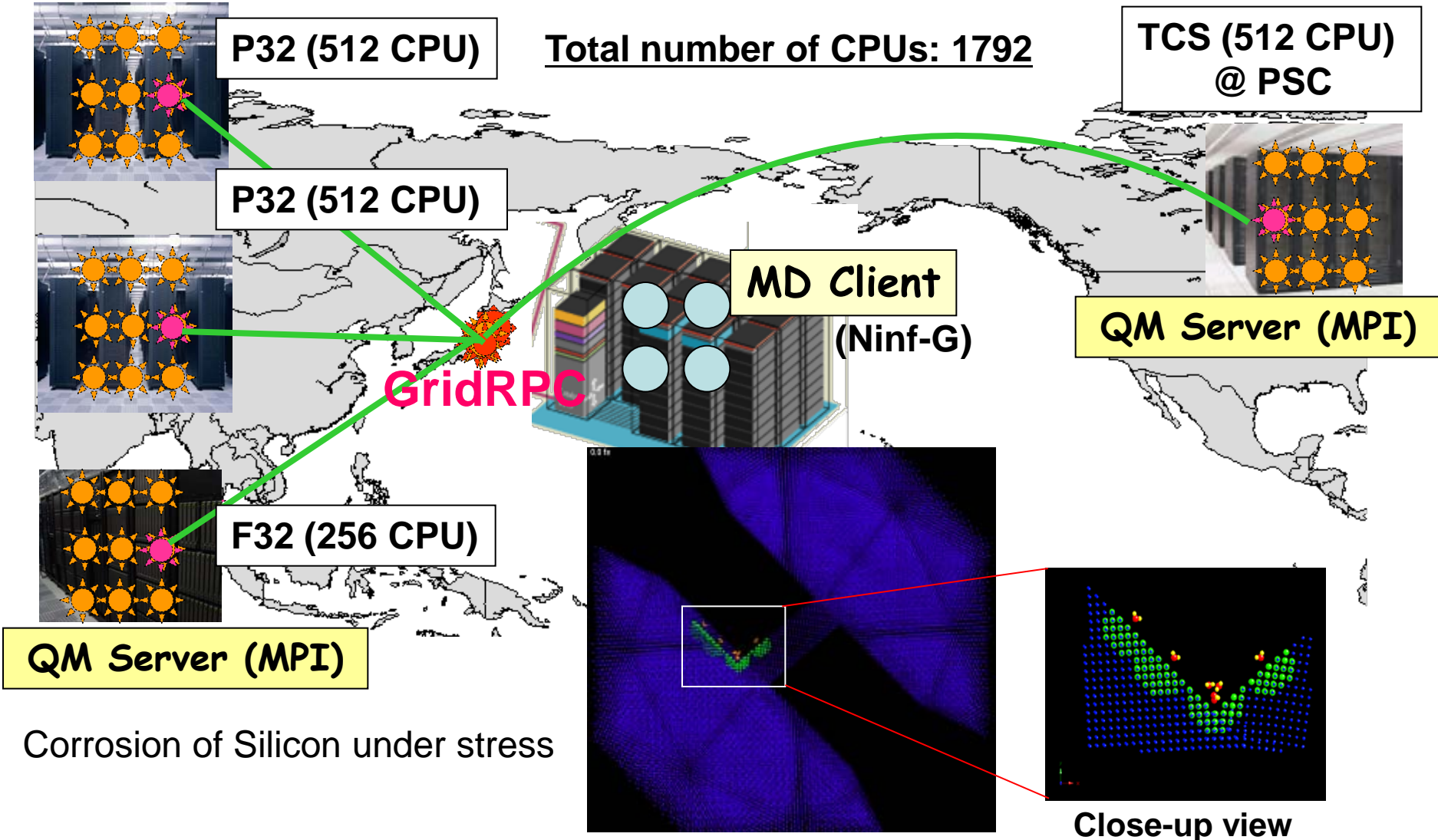
Cumulative results

of executions by 2 users: 43
 Execution time (Total) : 1210 h (50.4 days)
 (Longest) : 164 h (6.8 days)
 (Average) : 28 h (1.2 days)
 Total # of RPCs : 2,500,000
 Total # of RPC failures : 1,600
 Error ratio : 0.064 %

■ Total 8 countries / 10 sites / 104 nodes / 210 CPUs

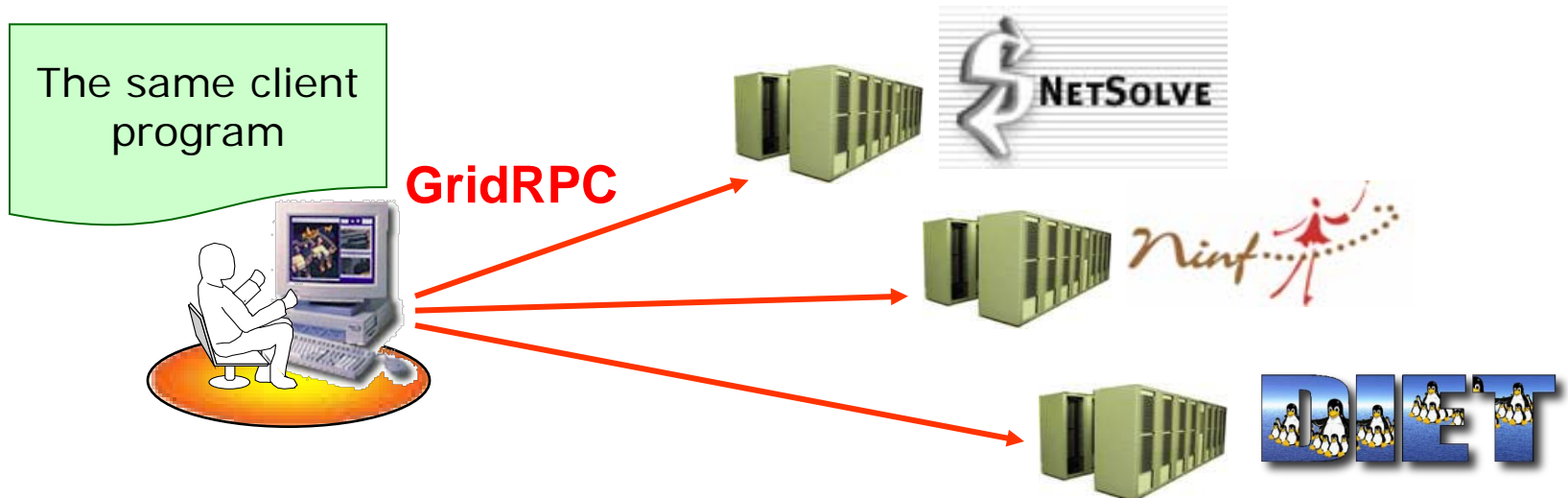


Large-scale Experiment (RPC+MPI)



To make GridRPC practicable

- API standardization work in the Open Grid Forum
 - The end-user APIs became one of the first OGF standards.
 - Interoperability testing (in 2006)
 - GridSolve (UTK/ICL), Ninf-G (AIST/GTRC) and DIET (INRIA)
 - Proposing Data management APIs (on-going)
 - To provide a higher level programming interface
 - Task farming, task sequencing, and etc.

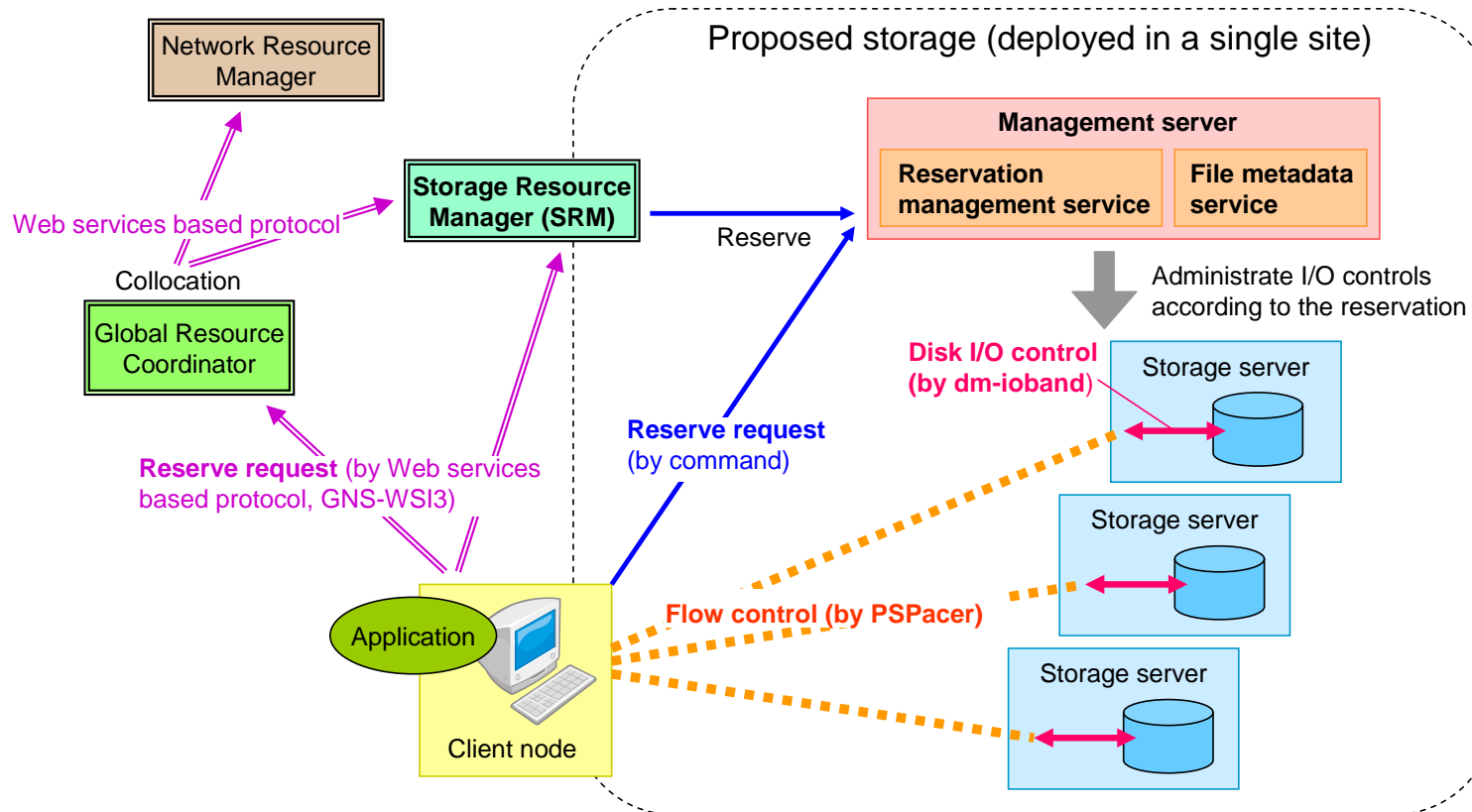


Recent research topics

- Motivation
 - Support of “data-intensive” applications
 - Next of Grid/Cloud computing
- Two projects
 - Performance assurance in a distributed storage
 - Storage resource management for QoS/SLA
 - End-to-end I/O cost estimation and rate control
 - Disk scheduler, storage network path, buffer cache and etc.

Performance assured storage (1)

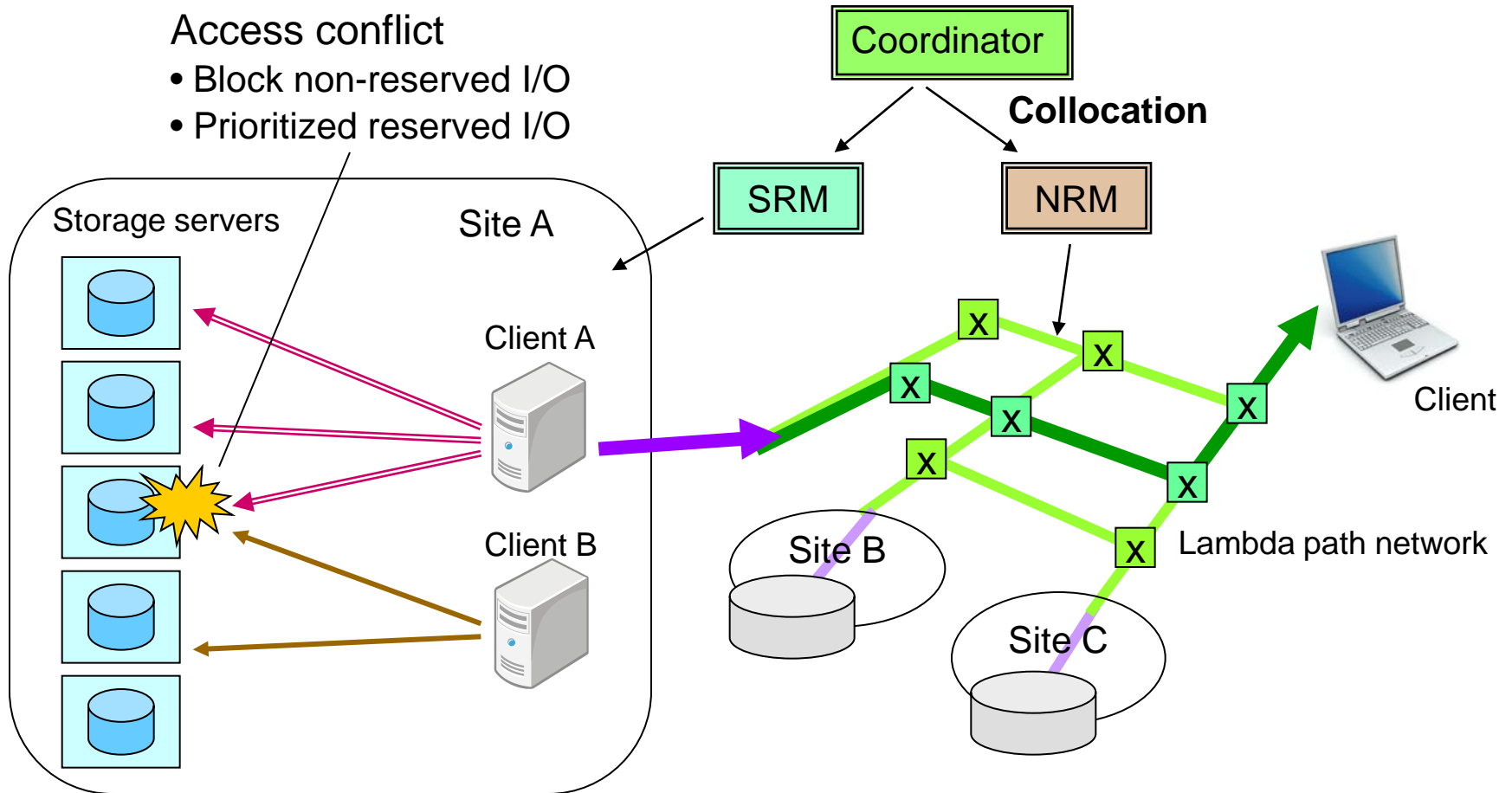
- Application driven, advanced, time-based reservation
 - Users can specify date, time, and read/write throughput.
 - The storage servers are dedicated to the user or the user's access is prioritized.



Performance assured storage (2)

a) Use it as a parallel file system

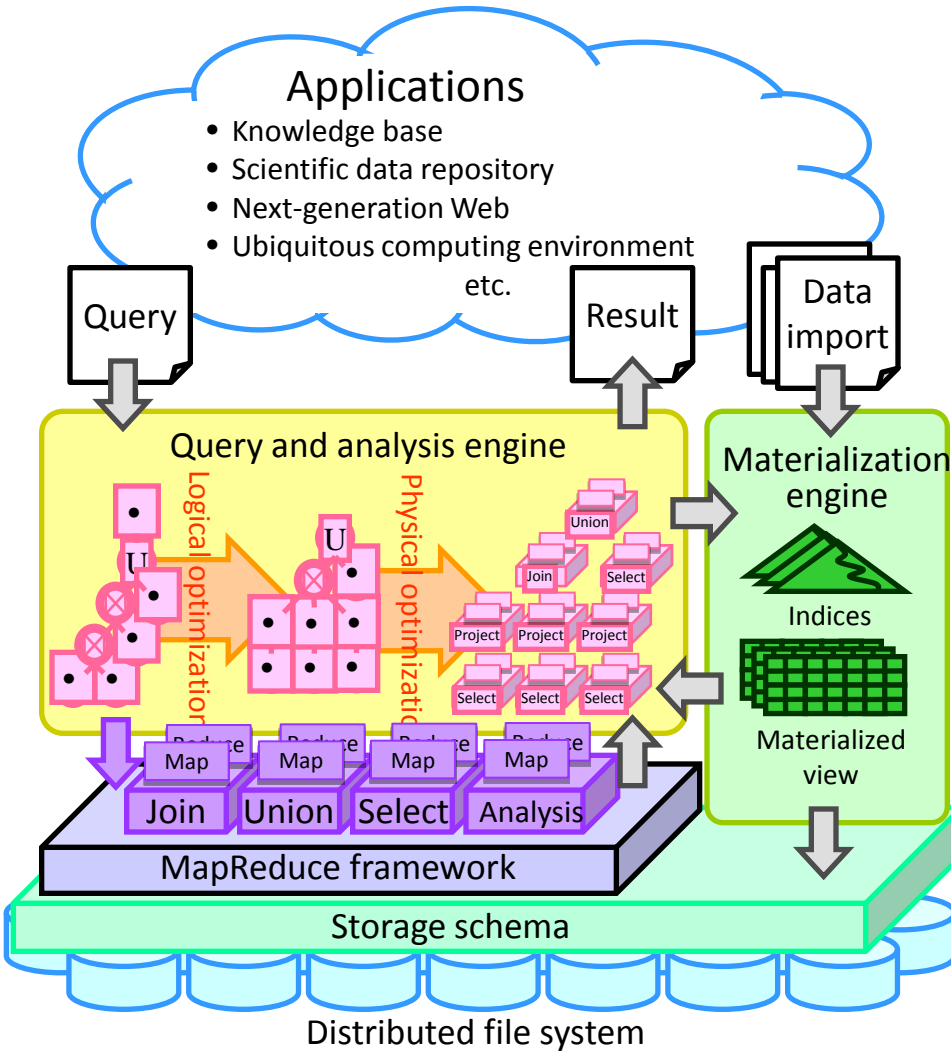
b) Use it with a bandwidth guaranteed dynamic network



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 - Scalable processing infrastructure for “linked data”
 - Metadata explaining data and relationships
 - RDF (Resource Description Framework)
 - Query processing and analysis of semi-structured data

Linked-data processing infrastructure



- Adaptive query optimization
 - Cooperate with distributed processing/storage systems
 - workload
 - replication
 - failure
- Rule-based processing
 - Reasoning (e.g. closure)
 - Need to find out sub-graphs of RDF by:
 - SQL/MapReduce?
 - Special algorithm/MPI?

Re-integrate HPC and Database technologies



From Ninf team in AIST

