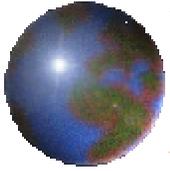


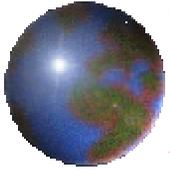
SAM and D0 Grid Computing

Igor Terekhov, FNAL/CD



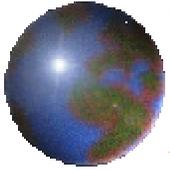
Plan of Attack

- ✦ Overview of projects and relevance to d0 remote analysis
- ✦ Distributed aspects of SAM
- ✦ D0 Grid directions and promises
- ✦ D0 Grid involvement of d0race players



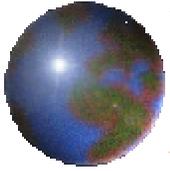
SAM and D0 Grid projects

- ◊ These overlap (SAM is de facto a data grid by its design, some people in both) but are different
- ◊ Project type and members
 - SAM is large, mature, strictly CD staff with some D0 (and CDF?) participation
 - D0 Grid is emerging, has newly funded PPDG component, has active offsite D0 collaborators (you)
- ◊ Scopes
 - SAM primarily (historically) deals with central issues, from Enstore to FNAL security issues
 - D0Grid is strictly about distributed issues
- ◊ Both aim at enabling distributed analysis (with foci on data and job handling, respectively and overlap in metadata)



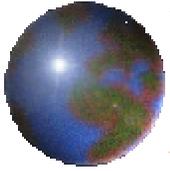
SAM and distributed (remote) analysis

- ✚ Central database for the meta-data catalog
 - ✚ Logical (scientific) description of data
 - ✚ Physical handling of data (replica catalog, resource allocation and usage)
 - ✚ Reliable bookkeeping of data contents and processing history
 - ✚ Is however a potential bottleneck and a single point of failure
- ✚ Stations are fully distributed
- ✚ Resource manager (optimizer) to be distributed



SAM as a grid of stations

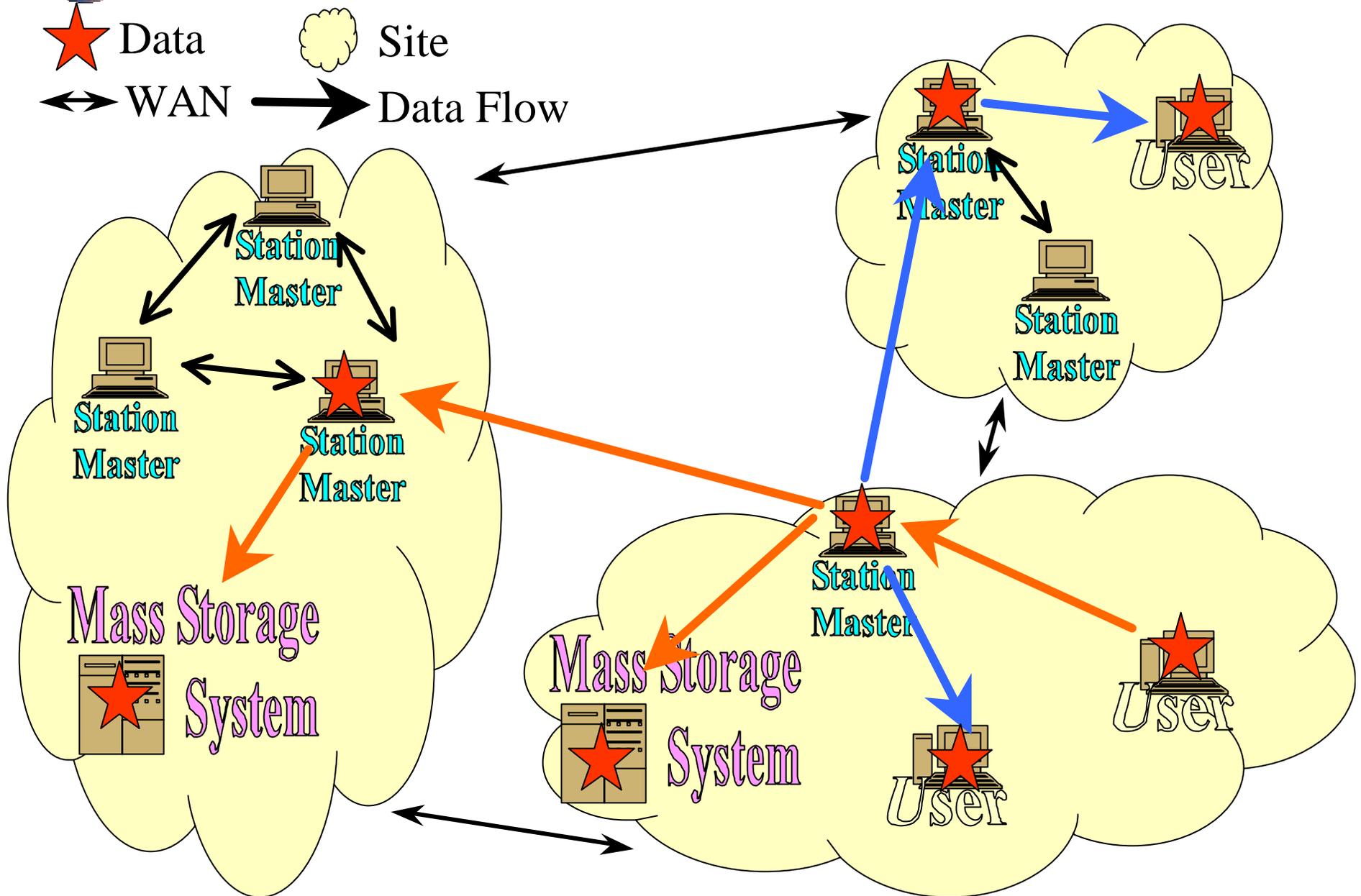
- ❖ Stations use *the replica catalog* to retrieve files from anywhere:
- ❖ Although Enstore at FNAL is the first and foremost MSS, other (multiple) MSS's are supported
- ❖ Stations may (and do) retrieve data from other stations.
- ❖ *Replica selection* is possible
- ❖ Many different *file transfer mechanisms* are supported (rcp, bbftp, Globus gridftp, encp, etc), others may be added



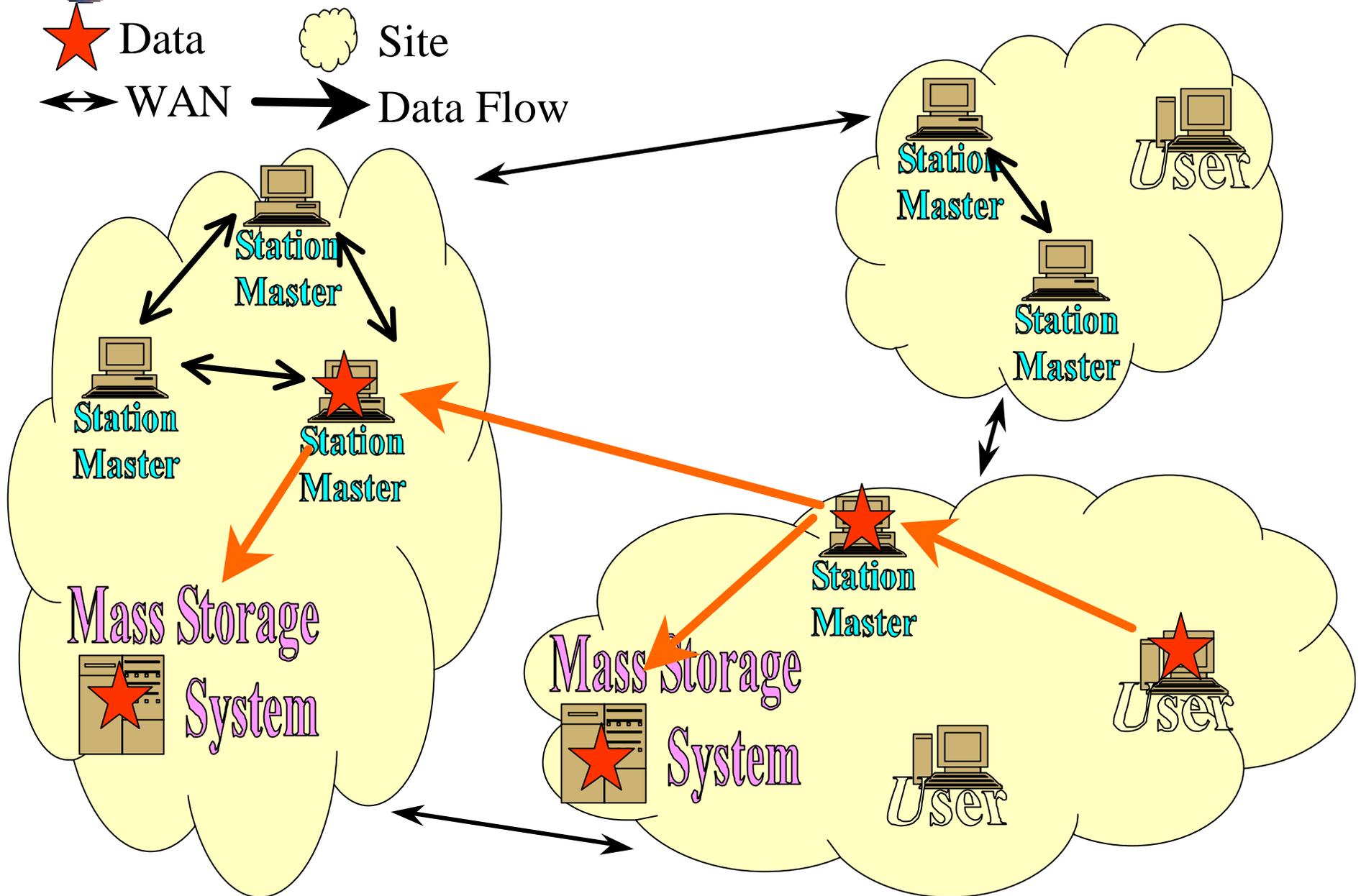
Global Data Forwarding and Replication

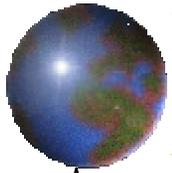
- ✚ Storage from remote centers is fully operational today: MC import from UK, NL, FR.
- ✚ Data retrieval via interim station is being enabled symmetrically
- ✚ Initial (pilot) implementation being tested with Lancaster, IC London, others are encouraged to join. Limitations in some second-order effects
- ✚ Full-fledged implementation in the works

Routing + Caching = Replication



Routing + Caching = Replication

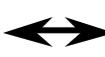




Data



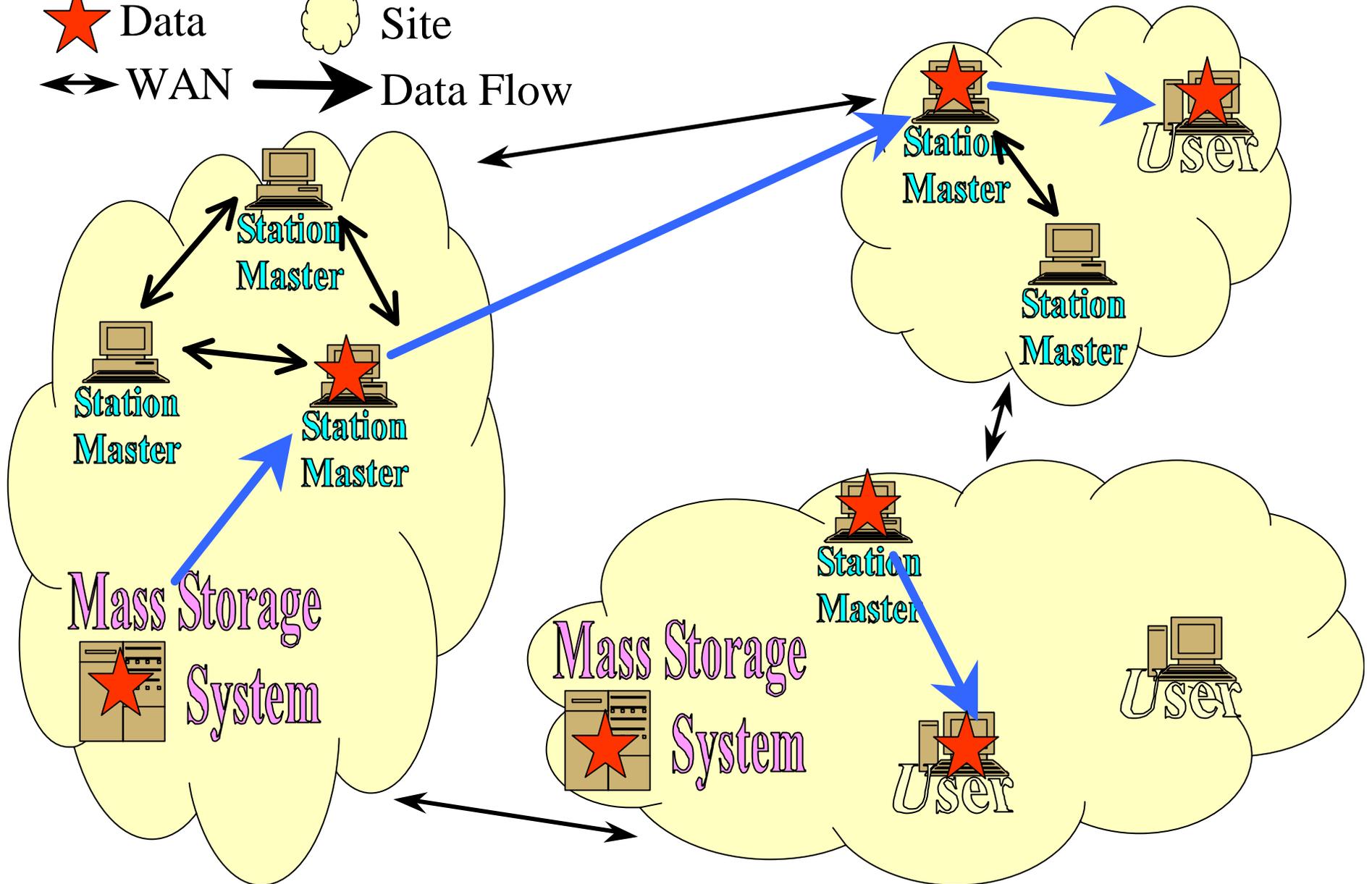
Site

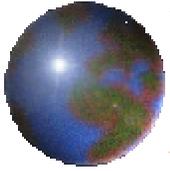


WAN



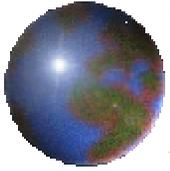
Data Flow





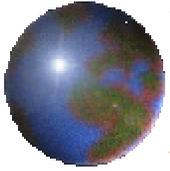
Summary of Remote analysis with SAM today

- ❖ One can use the existing station software to process locally (on site) cached data in exactly the same way it's used on d0mino
- ❖ Replica selection – discourage or disable impossible retrievals , e.g., direct from Enstore; use local MSS when applicable
- ❖ Initial data caching at the site: use the routing mechanisms to obtain the data e.g. from Enstore via d0mino.



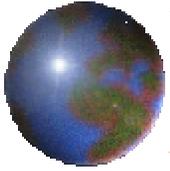
SAM enhancements for the distributed (remote) processing

- ✦ Full-fledged global routing and replication
- ✦ Hierarchy of the resource managers – MSS-specific- > site-wide- > global
- ✦ De-centralization of the Information services (replica and other MD catalog, CORBA naming service)



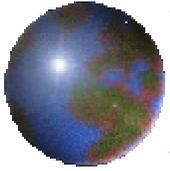
D0 Grid Goals

- ❖ Adopt the standard, elemental Grid technologies, to “grid-enable” SAM and D0
 - ❖ Inter-operability with other Grids
- ❖ Job management
 - ❖ Logical: specification, description, structuring (MC, chained processing, high-level checkpointing)
 - ❖ Physical: scheduling and Resource Management
- ❖ Monitoring (and Information Services)
 - ❖ Individual job status
 - ❖ Grid (sub)system as a whole (what’s going on?)



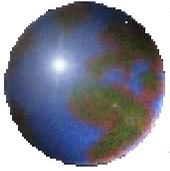
D0Grid Deliverables for Analysis

- ✿ Job Description Language (6 months)
 - ▣ Describe application in a portable, universal way
 - ▣ Multiple stages “chained” (DAGged)
 - ▣ Parallelism
 - ▣ Handling of output (store, define a dataset, etc)



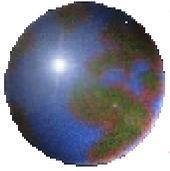
D0Grid Deliverables for Analysis

- ✿ Submit and execute job (months)
 - ❑ Sam submit (0) -> d0grid submit(6) -> Grid submit(24)
 - ❑ System will co-locate jobs and data
 - ❑ Execution at an island site (network disconnect from FNAL/the rest of D0 grid) (9 months)
 - ❑ Whole job brokering (system selects based on data availability, resource usage etc)
 - Advisory service only (6 months)
 - Automated global dispatch (station selection – 9-12 months)
 - ❑ Decomposition and global distribution of job parts for ultimate throughput (24 months)



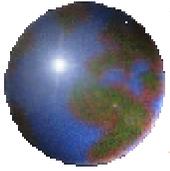
D0Grid Deliverables for Analysis

- ❖ Information Services (SAM internal metadata) decentralized – 9 months
- ❖ Monitor individual jobs, throughput at a site/regional center, or the whole system
 - ❑ Submitted->pending->done->etc progress (6m?)
 - ❑ Where it was dispatched, remote monitoring of status (6m?)
 - ❑ Historical mining (what did I do 2 weeks ago?), including that at an island – 9-12 months
 - ❑ Monitor system performance and resource usage (24 months)



How YOU can contribute

- ✚ Use cases, use cases, use cases, before *any* design is attempted
 - ✚ How you want to define your (analysis) job
 - ✚ What execution conditions must be created at the target site? (D0 release tree built, binaries/solibs shipped, RCP files copied or accessed via DB)
 - ✚ How you want it executed (local/global, parallel, etc. Can you handle distributed job output? Can you combine output? Can you checkpoint your analysis program?)
 - ✚ How you want to see what's going on with the job or with the (sub)system (site)



Summary

- ❖ SAM is a functional datagrid providing distributed data access to D0
- ❖ D0 Grid aspires to enable globally distributed computing and analysis, on top of SAM as the data delivery system
- ❖ Analysis on the Grid is a top priority
- ❖ Will need your input at earlier stages as well as effort synergies