

Some Aspects of

The Particle Physics Data Grid Collaboratory Pilot (PPDG)

and

The Grid Physics Network (GriPhyN)



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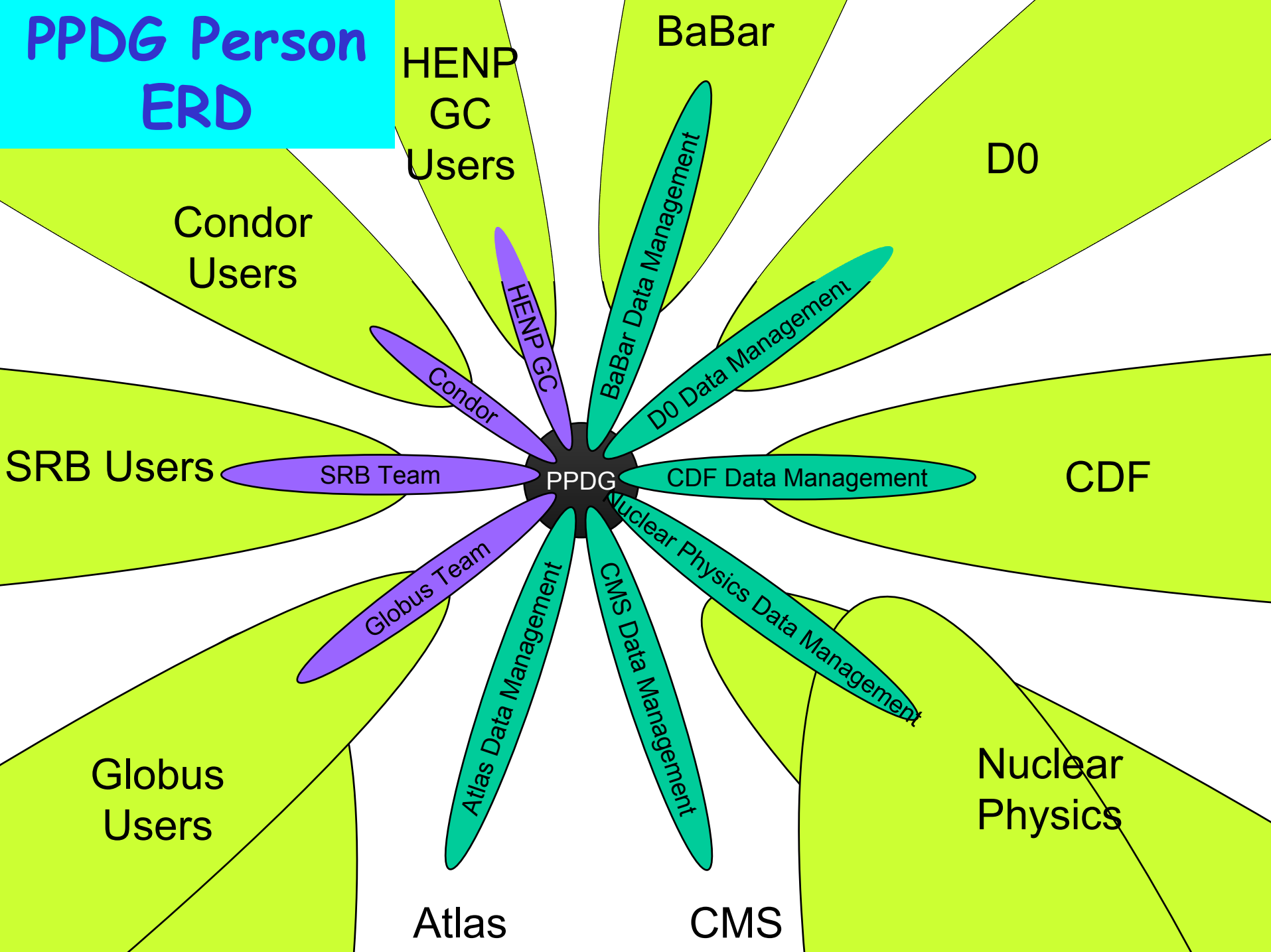
PPDG

- > 6 HENP experiments including 4 labs, 4 CS groups, >25 active participants
- > Atlas, BaBar, CMS, D0, JLAB, Star
- > DOE 3 year SciDAC proposal - expect to know about funding very soon.
- > Funding balanced towards experiments with CS funding for development and deployment.
- > Joint CS and Experiment integrated deliverables.

GriPhyN

- > 17 universities, SDSC, 3 labs, >40 active participants. 4 physics/astrophysics experiments
- > Atlas, CMS, LIGO, SDSS.
- > 3 years of NSF ITR funding started Sept 2000.
- > Funded primarily as an IT research project 2/3 CS + 1/3 physics. CS funding focus on students and post-docs.
- > Education and Outreach a focus

PPDG Person ERD



PPDG Goals

- > End-to-end integration and deployment in experiment production systems.
- > After one experiment uses software adapt/reuse/extend for other experiments.
- > Extend & interface existing distributed data access code bases with *Grid* middleware.
- > Develop missing components and new technical solutions.
- > Milestones for deliverables of the order of 1 year for each Project Activity

Experiment Specific Application
(Atlas, BaBar, CMS, D0, STAR JLAB)

Application-Grid interfaces

Generic Grid Services

Fabric-Grid interfaces

Experiment Specific Fabric & Hardware

PPDG to date:

- > High speed (100MByte/sec) point to point file transfer,
- > Common storage management adapters - HRM to SRB, HPSS, SAM, Enstore,
- > File replication prototypes - BaBar, GDMP
- > Input to Globus file replication management
- > Collaborative work was very loosely coupled to the overall project activities

PPDG future:

- > Project Activities from proposal: proposed activities
- > Understand how to relate these to CS teams who are also delivering to other funded responsibilities and clients.
- > Understand how to accommodate these within Experiments who have to "deliver to WBS"

PPDG CS Program & EU Data Grid WPs

- > Job Description Language - WP1
- > Scheduling and management of processing and data placement activities. - WP1
- > Monitoring and status reporting - WP3
- > Storage resource management - WP5
- > Reliable replica management services - WP2
- > File transfer services - WP2
- > Collect and document current experiment practices and potential generalizations - WP8

PPDG has no equivalent to date to WP4

Common s/w will we use

- in the best case

PPDG (and GriPhyN) include the leadership of existing Grid middleware

- Condor
- Globus
- Storage Resource Broker

It is natural/required/expected that we will use software from these groups.

Existing S/w includes:

- Condor and Condor-G
- Class Ads as a component GridFTP
- Globus Replica Catalog
- Globus Replication Management
- LBL IDL definitions of HRM/DRM
- SRB as a system?

Will stimulate new services and extensions in core Grid software components

Concerns - in the worst case

- > Experiments have their own "data handling" systems at different stages of maturity developed by collaboration projects and /or consensus across many institutions and stakeholders.
 - BaBar
 - DO SAM
 - CMS ORCA + GDMP + ??
 - ATLAS mysql catalogs??
 - JLAB Java implementation only
 - Star existing data transfers
- > We will not be able to tolerate the overheads:
 - Experiments have milestones e.g. beam
 - Across experiment agreement
 - Accept s/w from outside over which we do not have complete control
 - Of not just doing it ourselves

PPDG Project Activity #1 - GDMP

- Prototype developed for Objectivity database replication for CMS Monte Carlo data between Cern and remote sites
- As part of PPDG will add more general features e.g. support for flat files
- Also an EUDataGrid WP2 sub-project
- As part of both projects integrated with Globus Replica Catalog. Open question is use of Globus replica management services
- Uses to date:
 - transfer CMS simulation data from Cern to remote sites.
 - SDSS Science database for query testing at remote site
- Under discussion for Atlas
- Issue in spades of how future developments get planned and executed.
- [GDMP URL](#)

Project Activity #2. - DO and University of Wisconsin Job Definition and Global Management layer

- Existing DO SAM (Grid enabled) distributed data handling & resource management system - including well developed file replication and disk caching services
- Aim to make use of existing/extended Condor services - ClassAdds, Condor-g job submission layer
- Develop functionality to benefit DO end users
 - in an architecture that provides well defined boundaries between SAM and extra services.
 - Allows reuse of concepts and design for e.g. CMS and reuse of actual software
- Condor team provides the liaising to INFN EUDG WP1 & WP1 PPDG liaison is ICL DO collaborator.
- Define scope and deliverables by the end of June
 - Job Definition Language and Distributed Management Features - extensions to existing SAM and Condor languages for Grid
 - Interface of new s/w to SAM
 - Demonstration application
- (need a name...)

Other PPDG-Activities to be defined soon ..

- > Star file replication using Globus replica catalog and management
- > BaBar data base transfer between Slac and IN2P3
- > Atlas use of GDMP and Globus
- > Java developments from JLAB with Globus
- > Disk Resource management in Star with LBL

- > Other Activities:
 - Participation in GriPhyn Discussions
 - Participation in EU/US Data Grid Coordination meeting

GriPhyN (from I. Foster All hands talk)

- Project has two complementary & supporting elements
 - IT research project: will be judged on contributions to knowledge
 - CS/application partnership: will also be judged on successful transfer to experiments
- Two associated unifying concepts
 - Virtual data as the central intellectual concept
 - Toolkit as a central deliverable and technology transfer vehicle
- Petascale Virtual Data Grids - demonstrate experiment applications using Virtual Data Concepts

GriPhyN Goals (Foster)

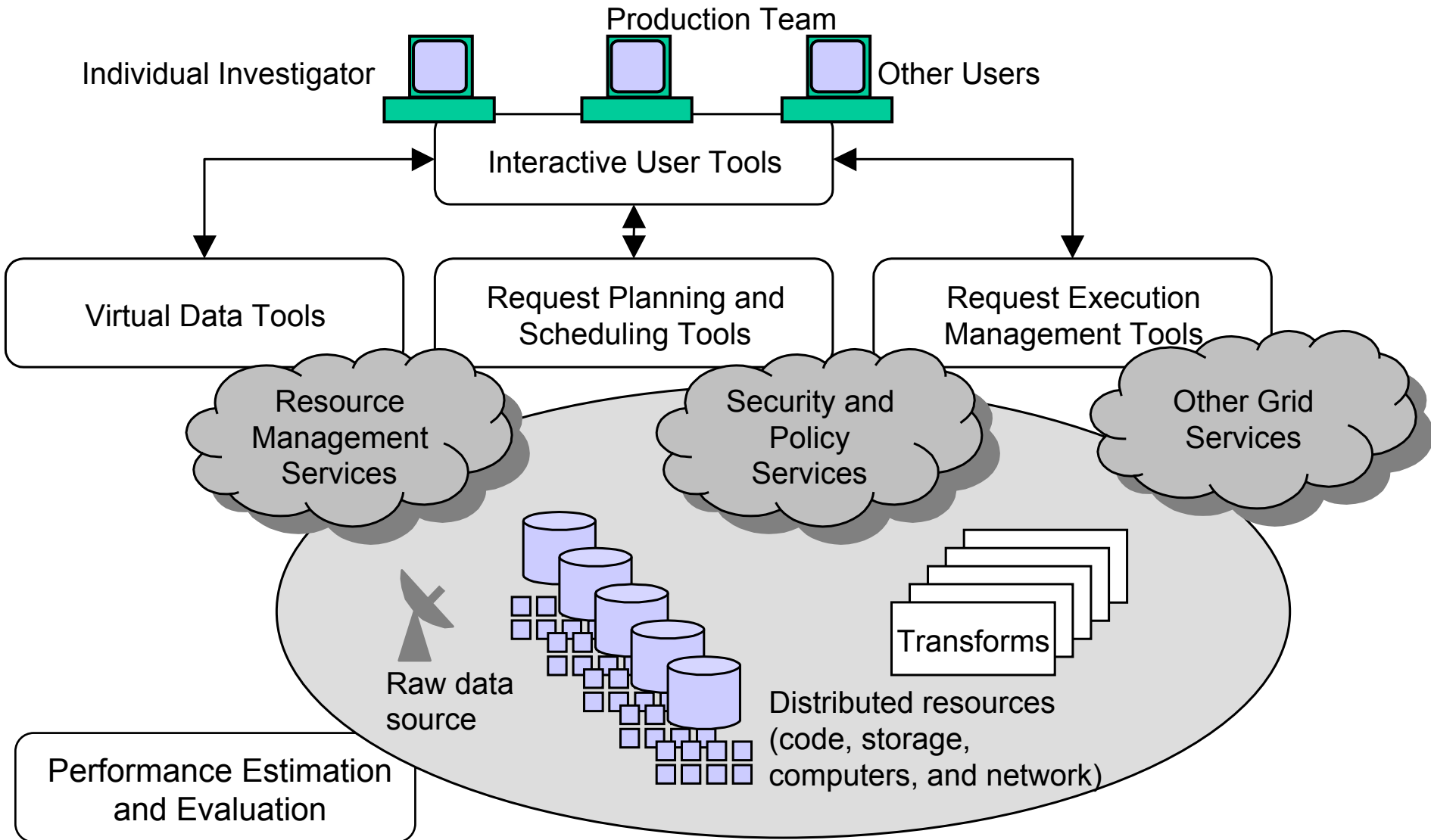
"Explore concept of virtual data and its applicability to data-intensive science," i.e.,

1. Transparency with respect to location
 - Known concept; but how to realize in a large-scale, performance-oriented Data Grid?
2. Transparency with respect to materialization
 - To determine: is this useful?
3. Automated management of computation
 - Issues of scale, transparency

Virtual Data Toolkit (Livny)

".. a primary **GriPhyN** deliverable will be a suite of *virtual data services* and *virtual data tools* designed to support a wide range of applications. The development of this *Virtual Data Toolkit* (VDT) will **enable the real-life experimentation** needed to evaluate **GriPhyN** technologies. The VDT will also serve as a primary **technology transfer mechanism** to the four physics experiments and to the broader scientific community".

Primary GriPhyN R&D Components



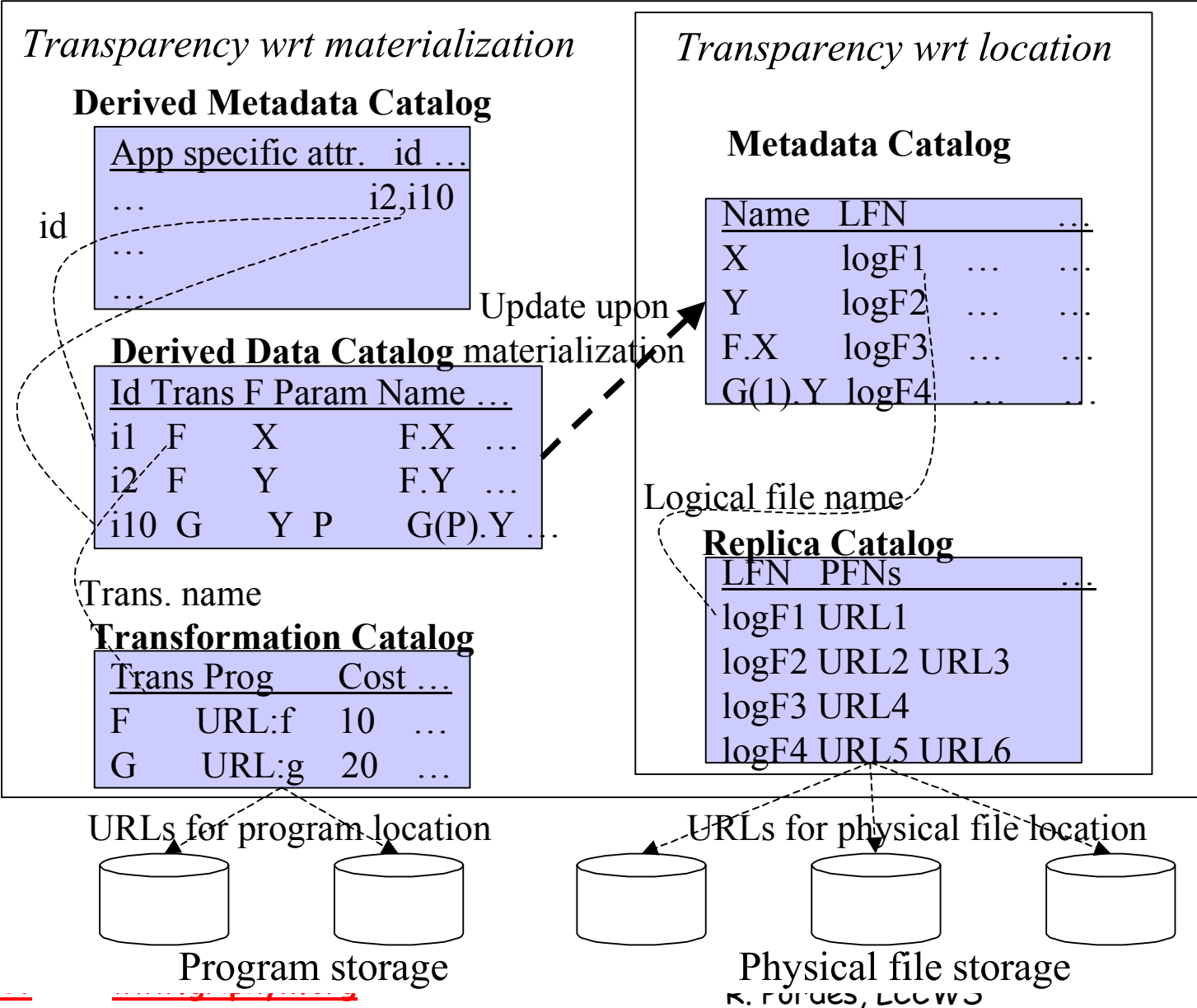
GriPhyN R&D from all-hands meeting

- Dynamic Replication Strategies for a High Performance Data Grid - Univeristy of Chicago
- Agent Grid Interfaces - Information Sciences Institute (ISI)
- Query Optimization - Caltech
- Data Base query research - UC Berkeley
- Issues in Fault Tolerance and the Grid - University of California San Diego
- NeST: Network Storage Flexible Commodity Storage Appliances - University of Wisconsin
- Prophecy: Performance Analysis & Modeling for Distributed Applications - Northwestern University
- High-performance bulk data transfers with TCP - University of Chicago
- Location-Transparent Adaptive File Caching - LBL

VDT V1.0 & Existing Components

- > On going activity to implement and harden existing Grid technology by the Condor and Globus teams
- > Condor job and resource management
 - Condor-G reliable and recoverable job management
 - DAGMan Basic job description, control and flow services
 - ClassAds resource publication and matching
- > Globus
 - MDS-2 information service: access to static & dynamic configuration & state information
 - GRAM resource access protocol
 - GridFTP data access and transfer protocol
 - Replica catalog, replica management
 - Grid Security Infrastructure: single sign on
- > SRB catalog services

GriPhyN Catalogs to date



finally...back to what is facing us in PPDG:

- > How to translate the "G" word into useful & ubiquitous services
- > How to actually deliver what was proposed
- > How will production deployment be achieved and supported.
- > Boundaries between and overlap between projects and experiment systems both in US and Europe?
- > Do the US Grid projects have holes in the architecture e.g. "WP4" functionality