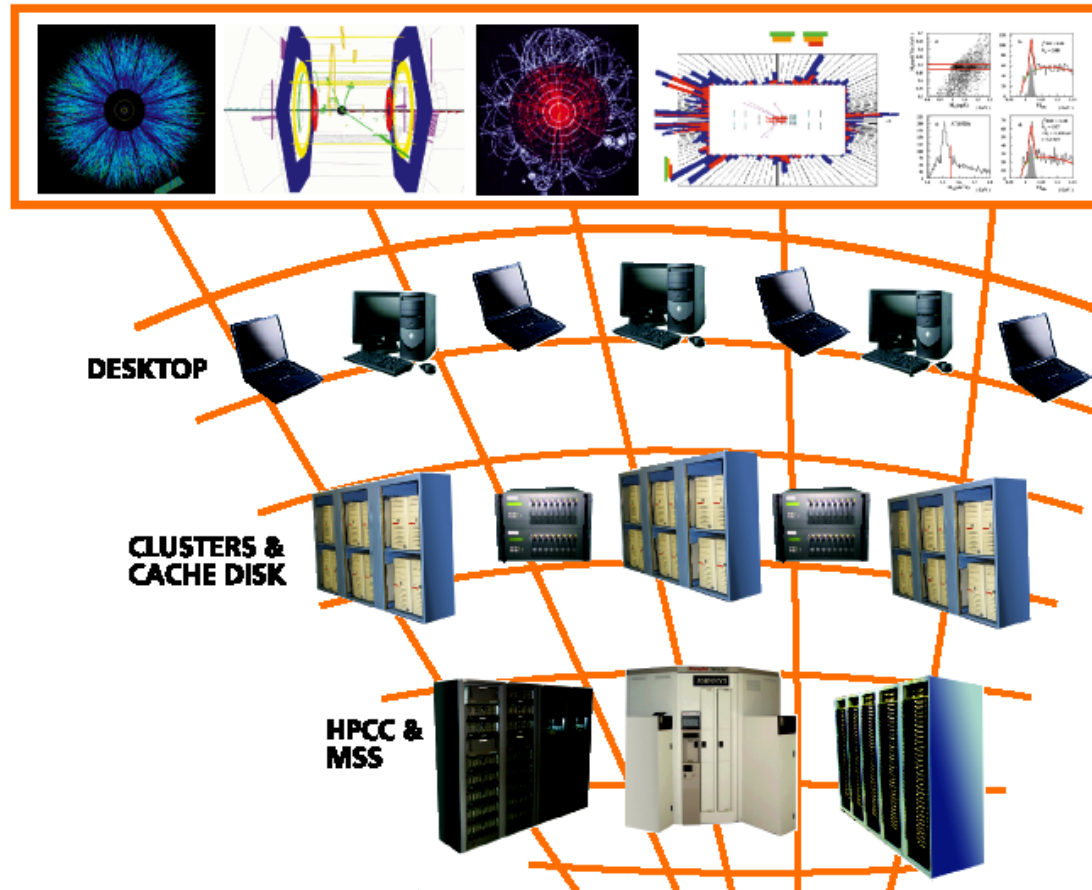


The Particle Physics Data Grid Collaboratory Pilot



LATBauerdick for Ruth Pordes, Fermilab

Scope and Goals

Who:

- OASCR (Mary Anne Scott) and HENP (Vicky White)
- Condor, Globus, SRM, SRB (PI, Miron Livny, U.Wisconsin)
- High Energy and Nuclear Physics Experiments - ATLAS, BaBar, CMS, D0, JLAB, STAR (PIs Richard Mount, SLAC and Harvey Newman, Caltech)
- Project Coordinators: Ruth Pordes, Fermilab and Doug Olson, LBNL

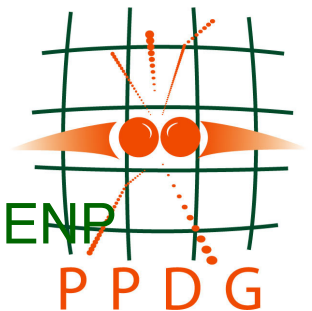
Experiment data handling requirements today :

- Petabytes of storage, Teraops/s of computing, Thousands of users,
- Hundreds of institutions, 10+ years of analysis ahead

Focus of PPDG:

- Vertical Integration of Grid middleware components into HENP experiments' ongoing work

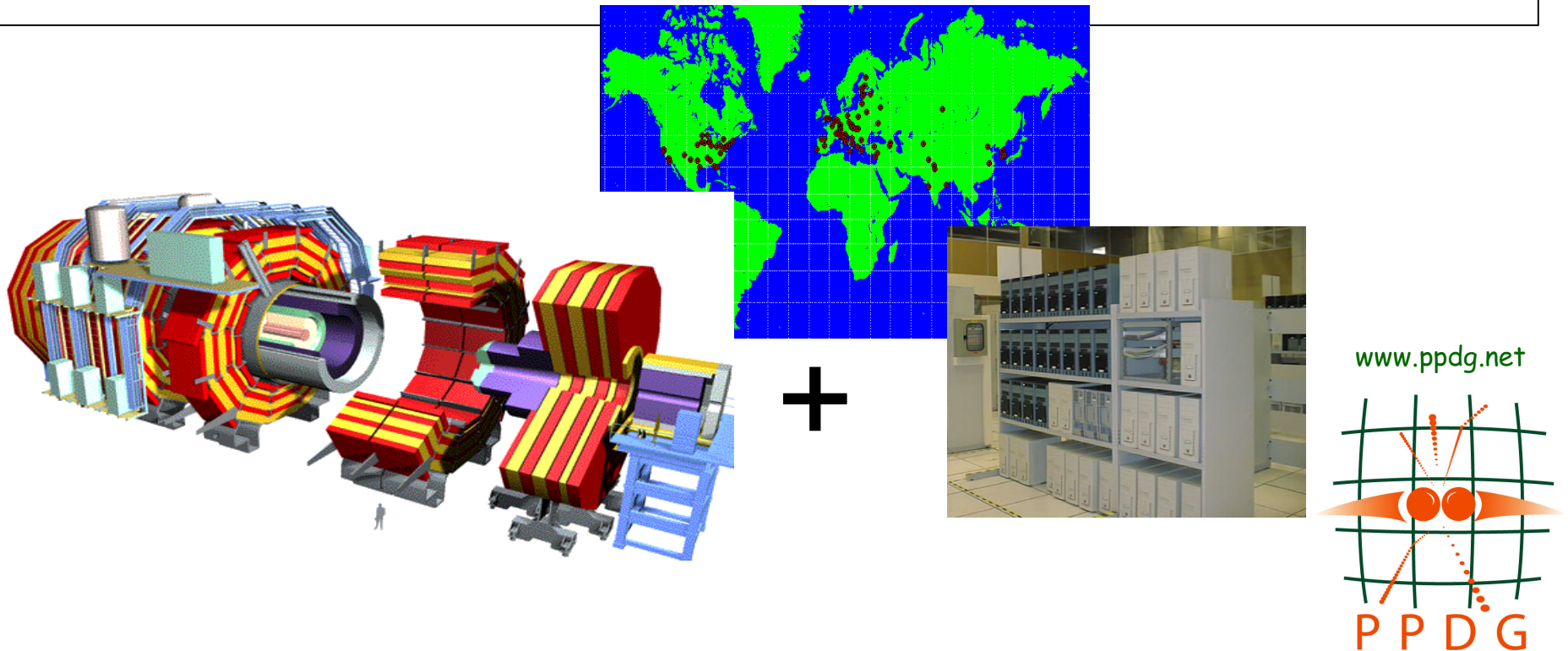
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Application: Global Scientific Experiments

The nature of how large scale science is done is changing

- distributed data, computing, people, instruments
- instruments integrated with large-scale computing



Current State of the Art

Awkward but workable infrastructure solutions allow existing experiments to carry out today's data intensive computational challenges.

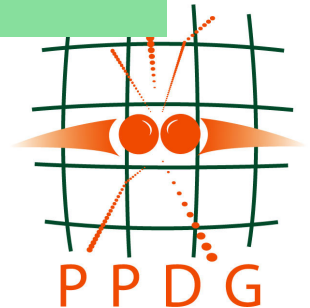
- Little or no re-use between centers
- Security issues

Manual (& labor intensive) data replication between centers.

Network is primary data transport mechanism

- Tapes stay in the robot and used only for massive storage capacity (Hurray!)

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The Novel Ideas

- End to end integration and deployment of experiment applications using existing and emerging Grid services.
- Deployment of Grid technologies and services in production (24x7) environments with stressful performance needs.
- Collaborative development of Grid middleware and extensions between application and middleware groups – leading to pragmatic and least risk solutions.
- HENP experiments extend their adoption of common infrastructures to higher layers of their data analysis and processing applications.
- Much attention paid to integration, coordination, interoperability and interworking with emphasis on incremental deployment of increasingly functional working systems.

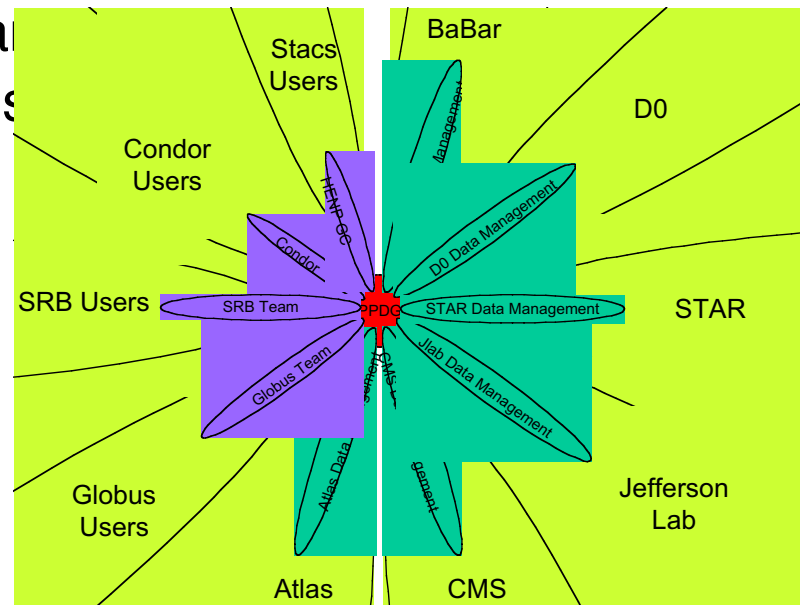
www.ppdg.net



Impact & Connections; Challenge and Opportunity

IMPACT.

- Make Grids usable and useful for the real problems facing international physics collaborations and for the average scientist in HENP.
- Improving the robustness, reliability and maintainability of Grid software through early use in production application environments.
- Common software and contributions

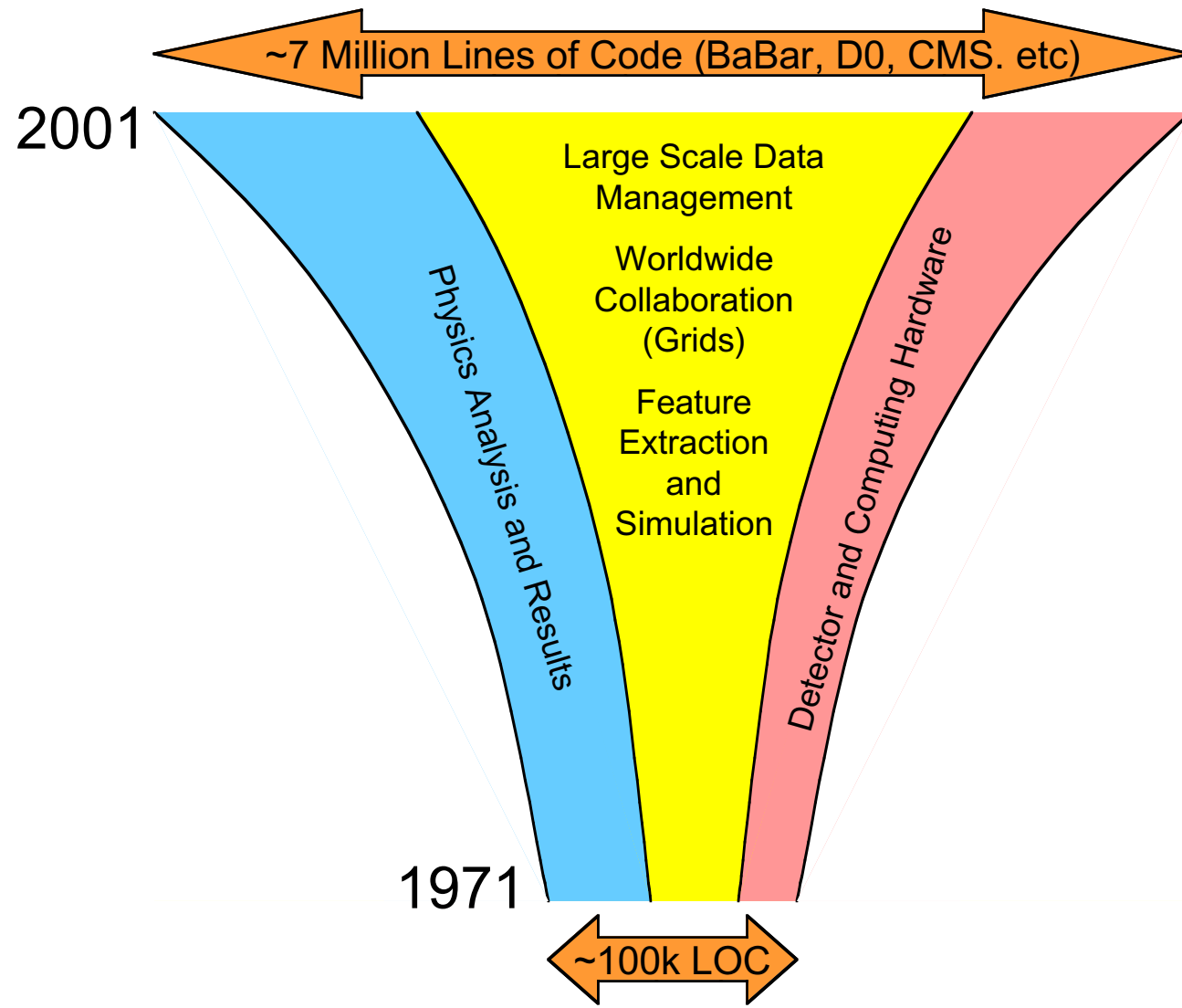


applicability

www.ppdg.net



The Growth of “Computational Physics” in HENP



www.ppdg.net

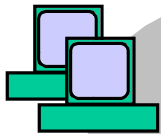


End-to-End Applications & Integrated Production Systems

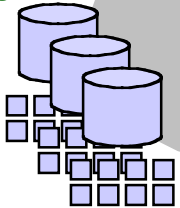
to allow thousands of physicists to share data & computing resources for scientific processing and analyses

☀ the challenges!

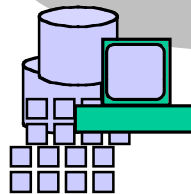
Operators & Users



Resources: Computers, Storage, Networks



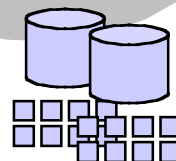
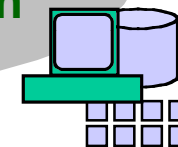
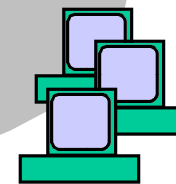
Put to good use by the Experiments



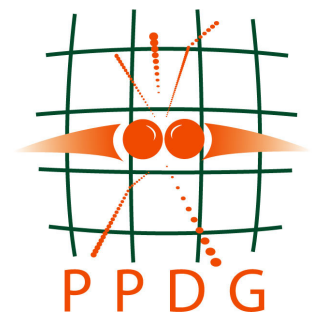
PPDG Focus:

- ☀ - Robust Data Replication
- ☀ - Intelligent Job Placement and Scheduling
- ☀ - Management of Storage Resources
- ☀ - Monitoring and Information of Global Services

Relies on Grid infrastructure:
- Security & Policy
- High Speed Data Transfer
- Network management



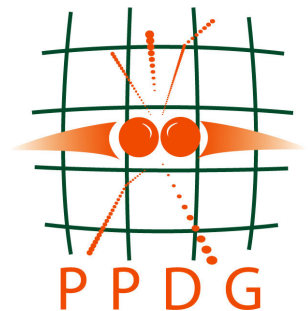
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Project Activities to date – “One-to-one” Experiment – Computer Science developments

- Replicated data sets for science analysis
 - BaBar – SRB
 - CMS – Globus, European Data Grid WP2 (GDMP)
 - STAR – Globus
 - JLAB – SRB
 - http://www.jlab.org/hpc/WebServices/GGF3_WS-WG_Summary.ppt
- Distributed Monte Carlo simulation job production and management
 - ATLAS – Globus, Condor
 - <http://atlassw1.phy.bnl.gov/magda/dyShowMain.pl>
 - D0 – Condor
 - CMS – Globus, Condor, EDG – SC2001 Demo
 - <http://www-ed.fnal.gov/work/SC2001/mop-animate-2.html>
- Storage management interfaces
 - STAR – SRM
 - JLAB – SRB

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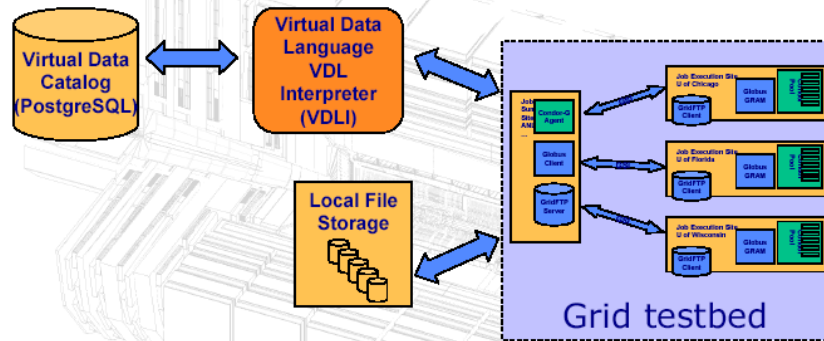
CMS Grid Prototypes in 2001



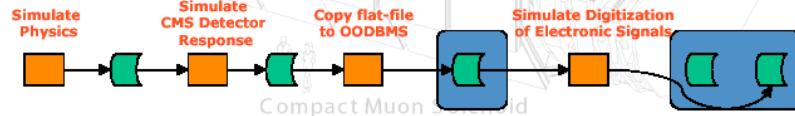
Virtual Data for Real Science: A Prototype Virtual Data Catalog



Architecture of the System:



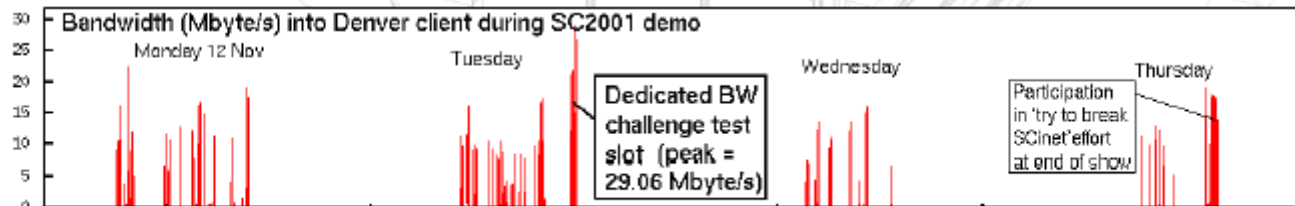
Production DAG of Simulated CMS Data:



01.07.2002

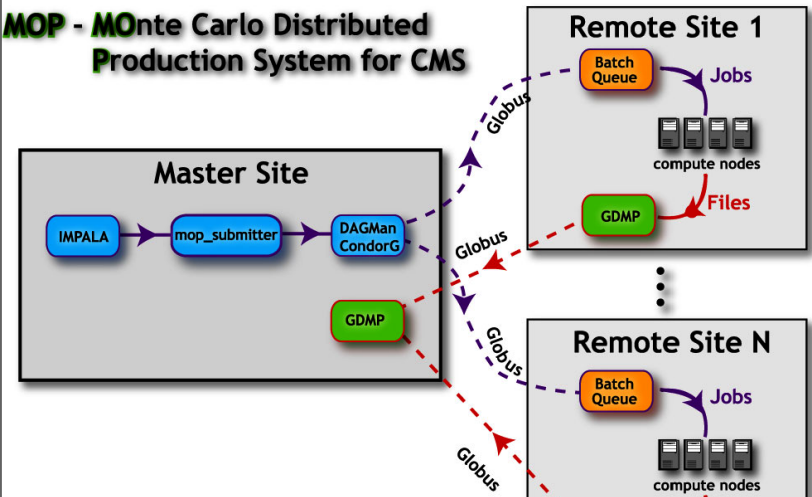
6

- Seamless, Easy Access to Data, which needed to:
 - give all CMS physicists equal access
 - successfully exploit all distributed computing resources

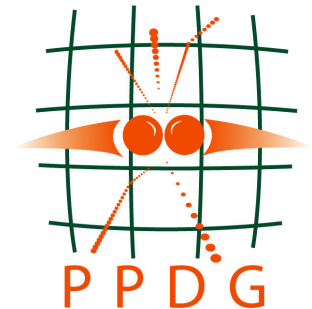


01 07 2002

MOP - MONte Carlo Distributed Production System for CMS

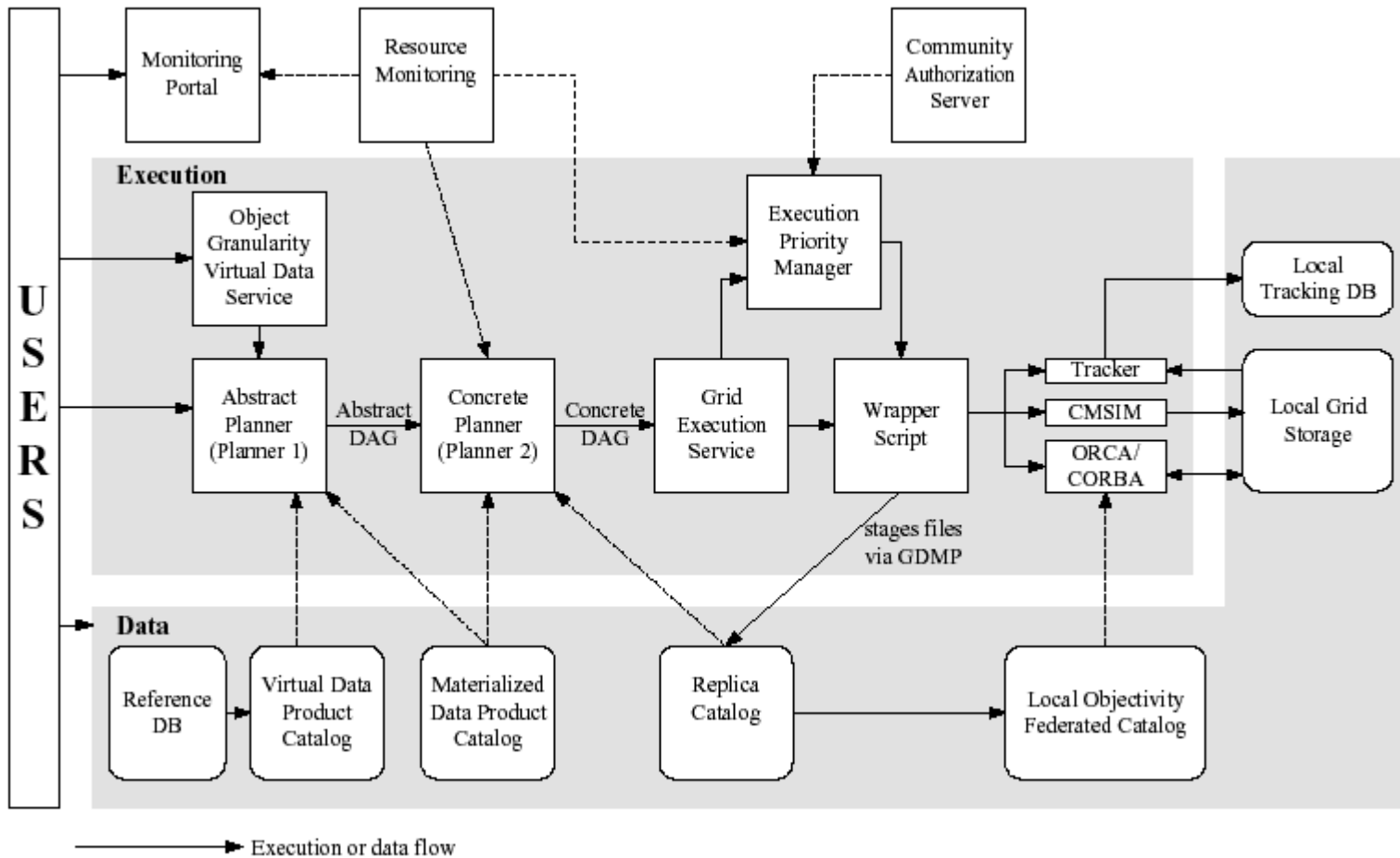


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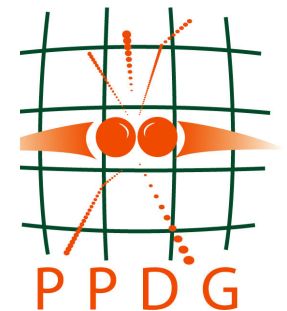


Goals for CMS Grid this year:

USCMS/GriPhyN/PPDG Prototype Virtual Data Grid System, v0.9.1-ajr Software Development and Integration Planning for Q1-Q3, 2002



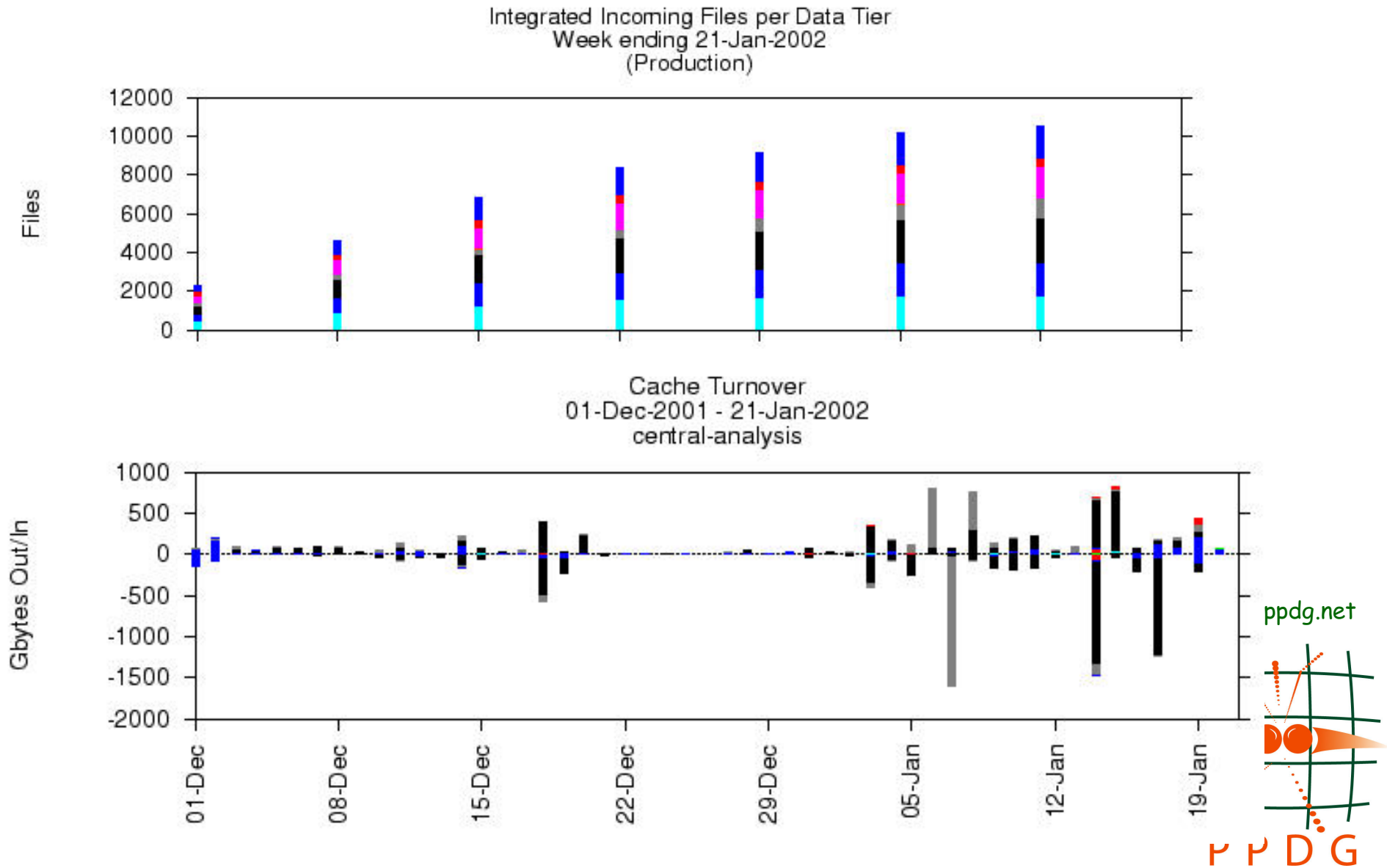
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Rf:A. Roy

See descriptions on page 2.

SAM- D0's Data Grid – is collaborating on PPDG, goal to move to common infrastructure





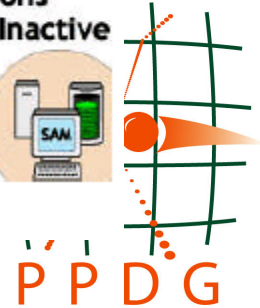
SAM Station Deployment

Distributing Data Across Continents

Mass Storage System

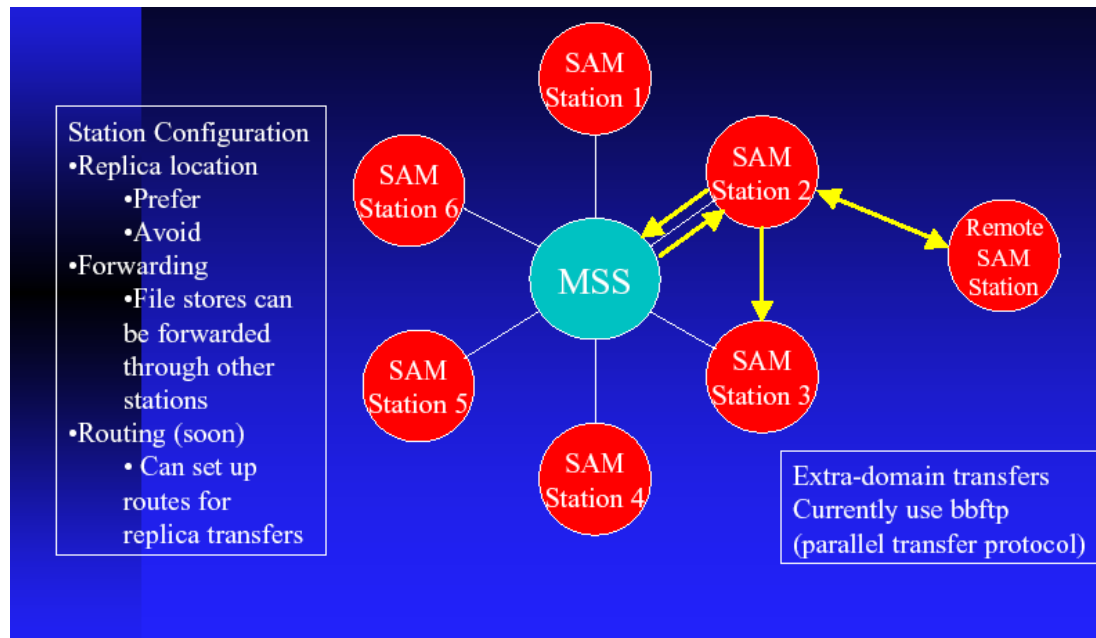


SAM Stations
Active Inactive



SAM Current Focus:

Multi-stage file routing and replication



Integration of GridFTP – sam_cp interfaces to encp, bbftp, kerberos-rcp, rcp already.

Job Submission language – sam submit –infile xxx –outfile yyy

Distributed Monitoring

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Cross-Cut – all collaborator - activities

Certificate Authority policy and authentication – working with the SciDAC Science Grid, SciDAC Security and Policy for Group Collaboration and ESNET to develop policies and procedures. PPDG experiments will act as early testers and adopters of the CA.

<http://www.envisage.es.net/>

Monitoring of networks, computers, storage and applications – collaboration with GriPhyN. Developing use cases and requirements; evaluating and analysing existing systems with many components – D0 SAM, Condor pools etc. SC2001 demo:

<http://www-iepm.slac.stanford.edu/pinger/perfmap/iperf/anim.gif>.

Architecture components and interfaces – collaboration with GriPhyN. Defining services and interfaces for analysis, comparison, and discussion with other architecture definitions such as the European Data Grid.

http://www.griphyn.org/mail_archive/all/doc00012.doc

International test beds – iVDGL and experiment applications.



Common Middleware Services

Robust file transfer and replica services

- SRB Replication Services
- Globus replication services
- Globus robust file transfer
- GDMP application replication layer - common project between European Data Grid Work Package 2 and PPDG.

Distributed Job Scheduling and Resource Management:

- Condor-G, DAGman, Gram; Sc2001 demo with GriPhyN
 - <http://www-ed.fnal.gov/work/sc2001/griphyn-animate.html>

Storage Resource Interface and Management

- Common API with EDG, SRM

Standards Committees

- Internet2 HENP Working Group
- Global Grid Forum

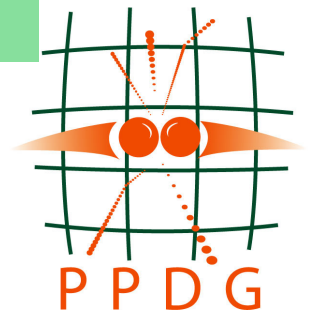
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PPDG Project Goals for 2002:

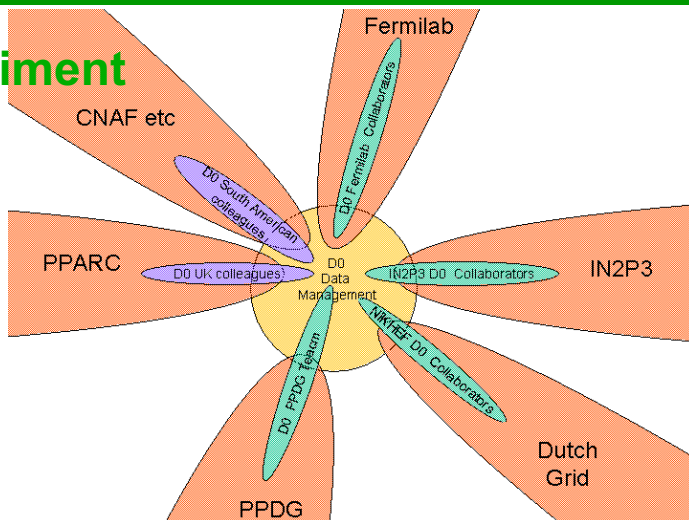
- Deploy reliable file transfer, replica catalog
- Storage resource management of local resource
- Resource monitoring & status reporting
- Integrate CMS simulation production with Condor-G / Globus
- Job description language specification
- Deploy PKI Registration Authority under DOESG CA with policies accepted by international HENP community
- Test prototype VO authorization service
- Integration of file transfer, replica catalog and job control in some experiments' production services

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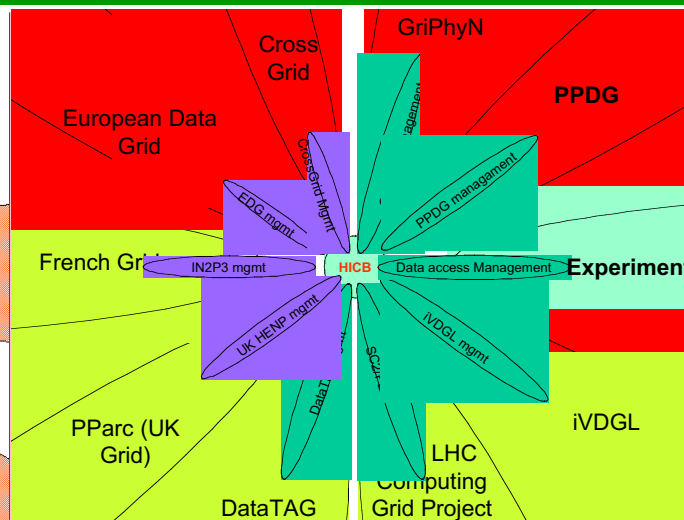


PPDG's World

An Experiment

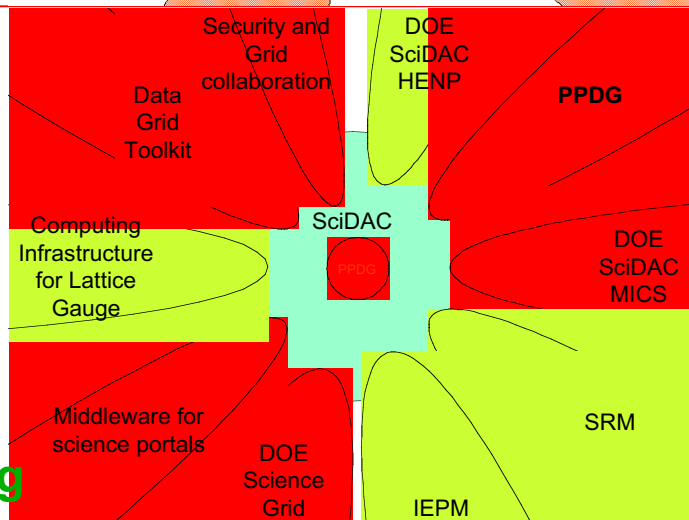


HENP Grid Projects

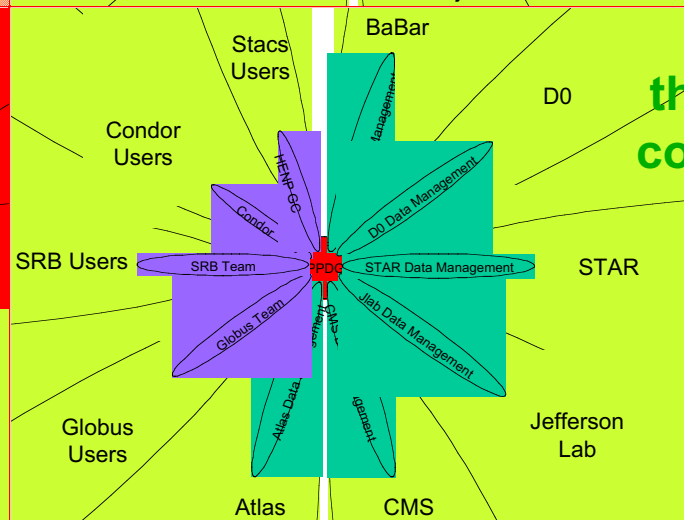


DOE

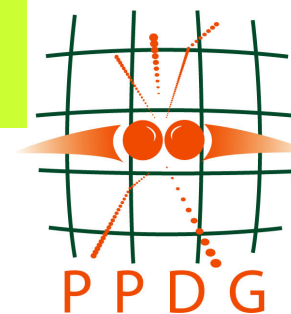
Scientific Discovery through Advanced Computing



the PPDG collaboration



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HENP Intergrid Coordination Initiative –its early days..

Mechanism for Intercontinental coordination across High Energy and Nuclear Physics Grids (experiments and projects).

InterGrid Coordination Board (HICB)

- representatives of computing management of experiments and grid projects – “self selected”
- meetings co-located with GGFs - single day, February 17th in Toronto will be 4th in the series. Typically around 25 attendees.

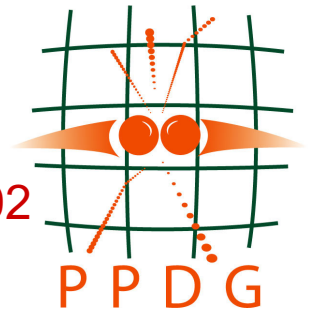
Joint Technical Board (JTB)

- technical representatives of Grid projects – initial selection 2 Asia, 6 EU, 6 US
- Monthly phone conferences – 3 so far.
- All members have “day jobs”.

Common Projects and Task Forces to address needs in specific technical areas:

Call for Testbed Proposals emailed to HICB on Jan 4th 2002

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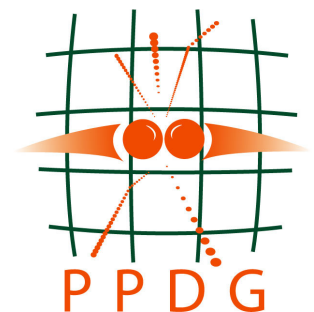
Participants in typical HICB meeting

Larry Price	Argonne	PPDG, GriPhyN
Fabrizio Gagliardi	CERN	DataGrid
Ian Foster	Argonne	PPDG, GriPhyN
Harvey Newman	Caltech	PPDG, GriPhyN
Doug Olson	LBNL	PPDG
Miron Livny	U. Wisconsin	PPDG, GriPhyN
Richard Mount	SLAC	PPDG
Paul Avery	U. Florida	GriPhyN
Federico Ruggieri	INFN	DataGrid
R.P.Middleton	RAL	UK; DataGrid
Mirco Mazzucato	INFN	Italy; DataGrid
Guy Wormser	IN2P3	France; DataGrid
Youhei Morita	KEK	Japan
Kors Bos	Nikhef	NL; DataGrid
Paul Messina	Caltech	
Jim Sadlier	PPARC	
LATBauerdick	FNAL	PPDG
Vicky White	DOE	
Les Robertson	CERN	DataGrid
Rob Gardner	U. Indiana	GriPhyN
Satoshi Sekiguchi	ETL	Japan
Arie Shoshani	LBNL	PPDG
Laura Perini	U. Milano	DataGrid
Carl Kesselman	USC/ISI	iVDGL, GriPhyN
Ruth Pordes	FNAL	PPDG
Satoshi Matsuoka	Tokyo Inst Tech	Japan

Joint Technical Board

Francesco Prelz	INFN	INFN,EDG
Marion Bubeck	Poland	CrossGRID
Antonia Ghiselli	INFN	DataTAG,EDG
Mike Wilde	ANL	GriPhyN
Rick Cavanaugh	UofFlorida	GriPhyN, iVDGL
Peter Couvares	UofWisconsin	PPDG
Doug Olson	LNBL	PPDG
Joseph Lefoll	Saclay	IN2P3,EDG
Ruth Pordes	FNAL	PPDG,iVDGL

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iVDGL/PPDG/GriPhyN TestBed Status

End-to-End Applications and TestBeds are

- Experiment defined and driven
- Hardware and effort provided from the experiment teams
- Each testbed/end-to-end application relies on a different mix of common infrastructure and experiment specific software

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iVDGL/PPDG/GriPhyN TestBed Status

- LHC experiment **protoypes and demonstrations** existing to date
- US-CMS SC2001 demos of
 - distributed job production across 4 sites Tier 1 + 3 Tier 2– MOP
 - Grid-enabled object collection Analysis for particle physics – 3 sites – SC2001 floor + 2 Tier 2
 - Derivation of parameters for simulation runs from transformations from “virtual data catalog” and generated production scripts.
- US-ATLAS
 - 8 site test bed with data movement, replication and cataloging using MAGDA
 - Distributed software archive package distribution and configuration management – PACMAN
 - Web portal (Grappa) for job scheduling

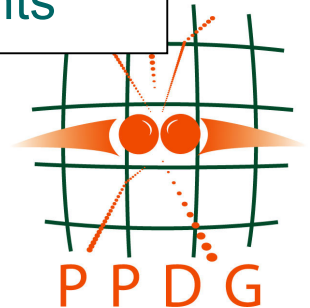


iVDGL/PPDG/GriPhyN TestBed Plans

HEP Experiment Applications and TestBed plans are reflected in the proposals made to the HICB:

- ALICE – distribute Alien for simulation production for Spring 2002.
- ATLAS – transatlantic tests tied to Data Challenge 1 in Mar 2002 and Data Challenge 2 in July 2002
- CMS – transatlantic test tied towards simulation production using Grid services. US goal for Spring 2002; CMS goal for Fall 2002??
- D0 – SAM in use for archiving of distributed simulation production and distributed caching data from tape for analysis.
- BaBar – distributed job production using EDG components

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And...

Infrastructure software components from different packaging and distributions sites must interoperate:

- US will download VDT 1.x or independent Globus/Condor/GDMP components.
- EU will download EDG Software 1.x releases

We need to determine if these are truly compatible. Heterogeneous configurations is taken as a given by the US Grid project collaborations. The issues has been identified but it is expected that there will need to be workshops, consensus and possibly concessions and definitely work in the details.

The experiments plan intercontinental job scheduling and production activities within ~12 months. This will require interoperability of

- Resource Discovery and Brokers
- Job Definition and Submission
- End-to-end error and status reporting, debugging aids etc.

