

**GRIP**  
UK  
Particle  
Physics



**A Tier1 Centre at  
RAL and more**

John Gordon

eScience Centre

CLRC-RAL

**HEPiX/HEPNT - Catania**

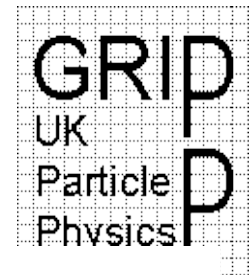
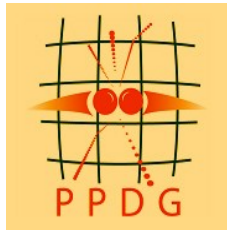
**19th April 2002**

# What is the Grid?



- ◆ The Grid means different things at different times to different people.
- ◆ For me it means a method of allowing a loosely-connected and geographically-distributed group of people to share a distributed set of resources with a minimum of restrictions.
- ◆ This group of people is known as a 'Virtual Organisation' and an HEP experiment is a good example of a VO.
- ◆ If the set of software used by different VOs has a large overlap with a lot of re-use, then we can say we have a Grid.
- ◆ Most current grids are basing their work on the Globus Toolkit

# HEP Grids





# MONARC



## Models Of Networked Analysis At Regional Centers

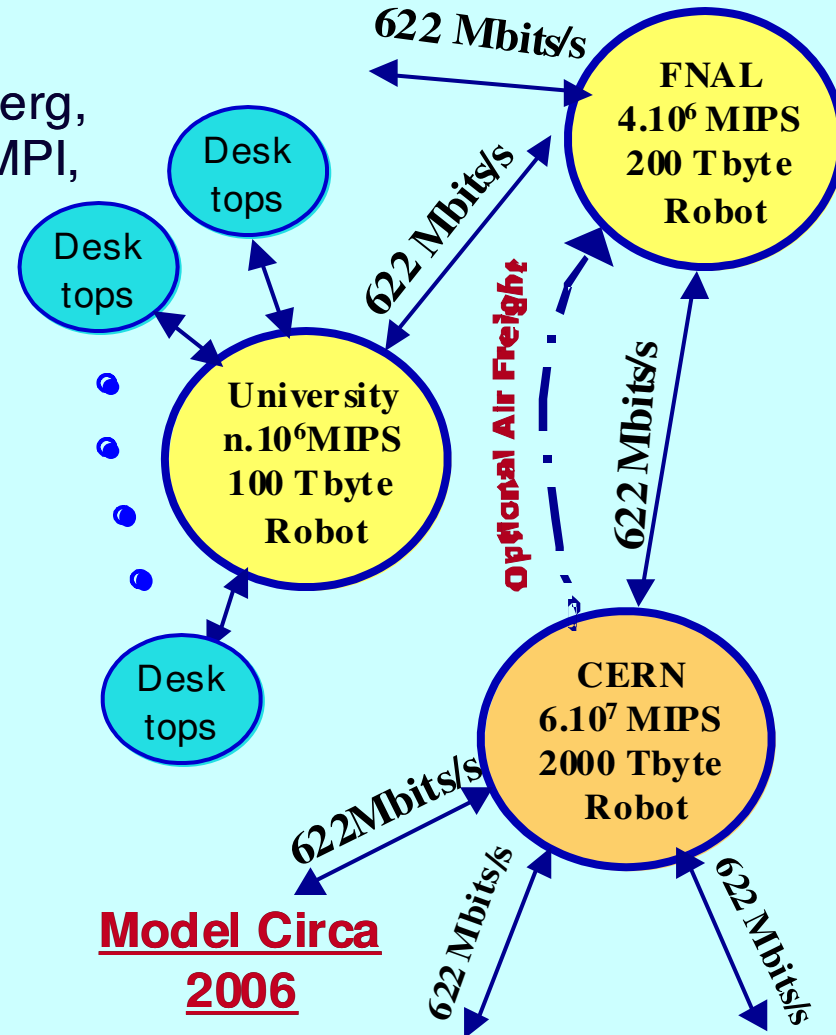
Caltech, CERN, Columbia, FNAL, Heidelberg,  
Helsinki, INFN, IN2P3, KEK, Marseilles, MPI,  
Munich, Orsay, Oxford, Tufts

### GOALS

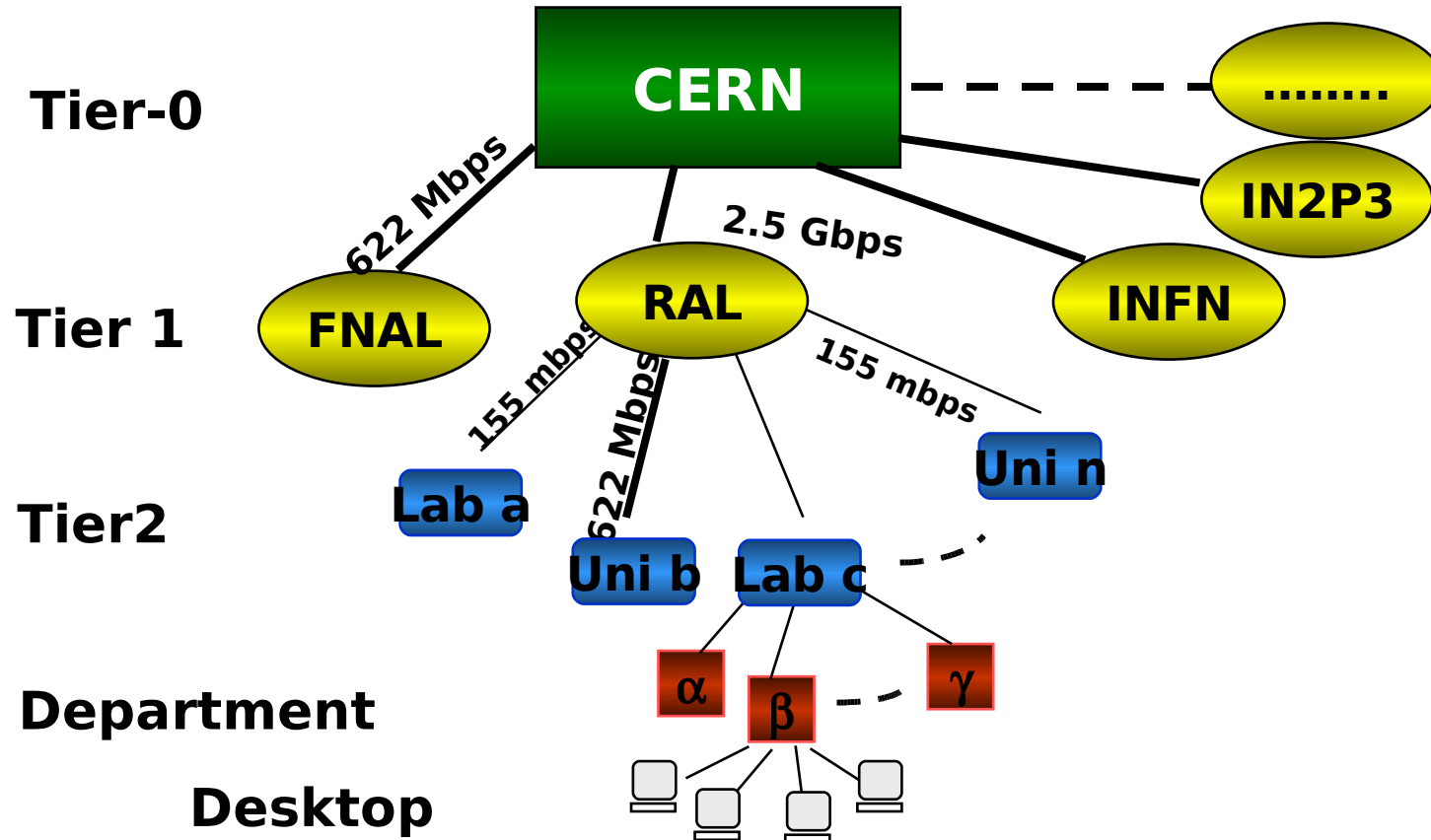
- ➔ Specify the main parameters characterizing the Model's performance: throughputs, latencies
- ➔ Develop "Baseline Models" in the "feasible" category
- ➔ Verify resource requirement baselines: (computing, data handling, networks)

### COROLLARIES:

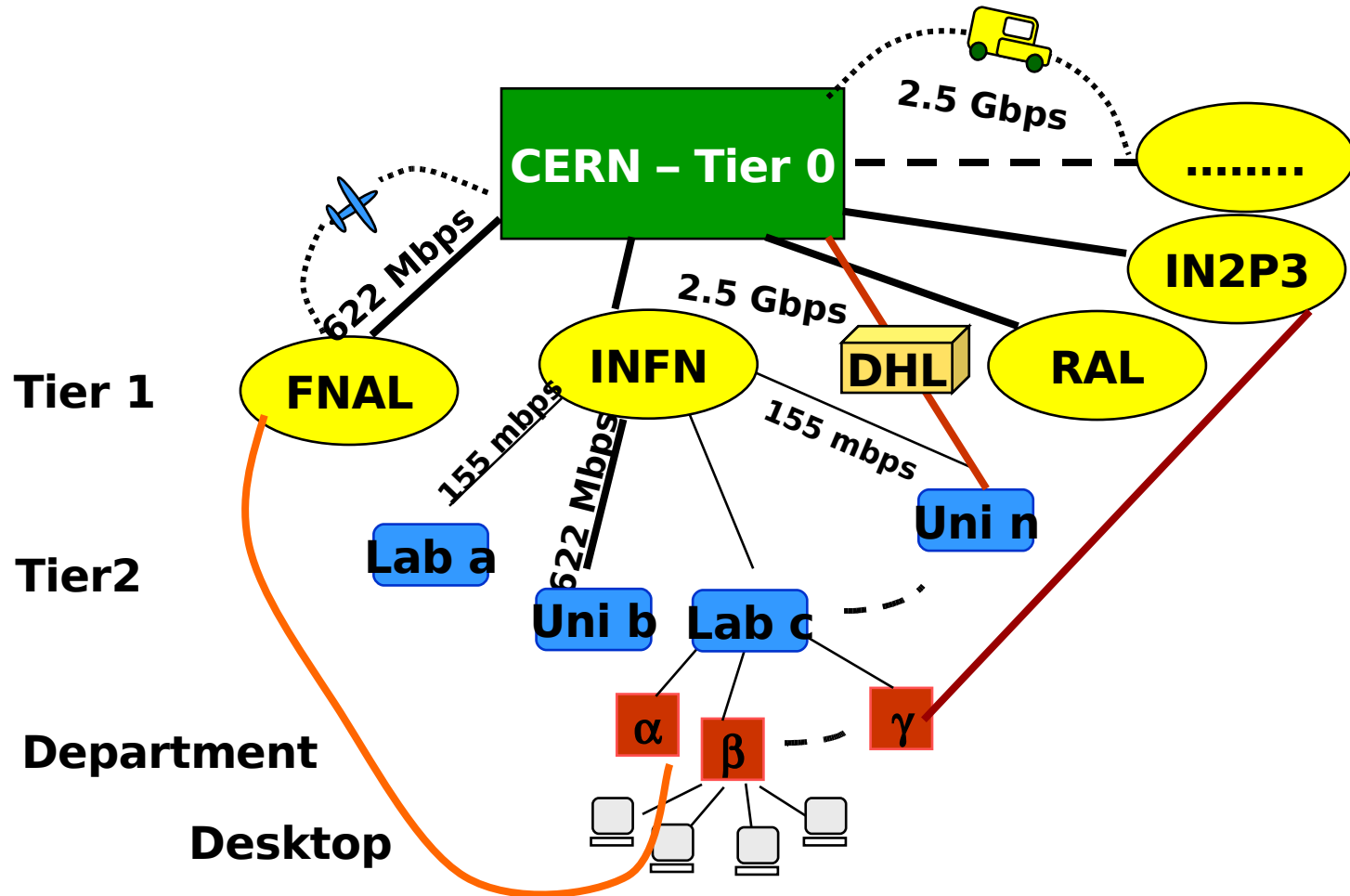
- ➔ Define and Design the **Analysis Process**
- ➔ Define **RC Architectures and Services**
- ➔ Provide **Guidelines** for the final Models
- ➔ Build and Provide a **Simulation System and Toolset** for Further Model studies



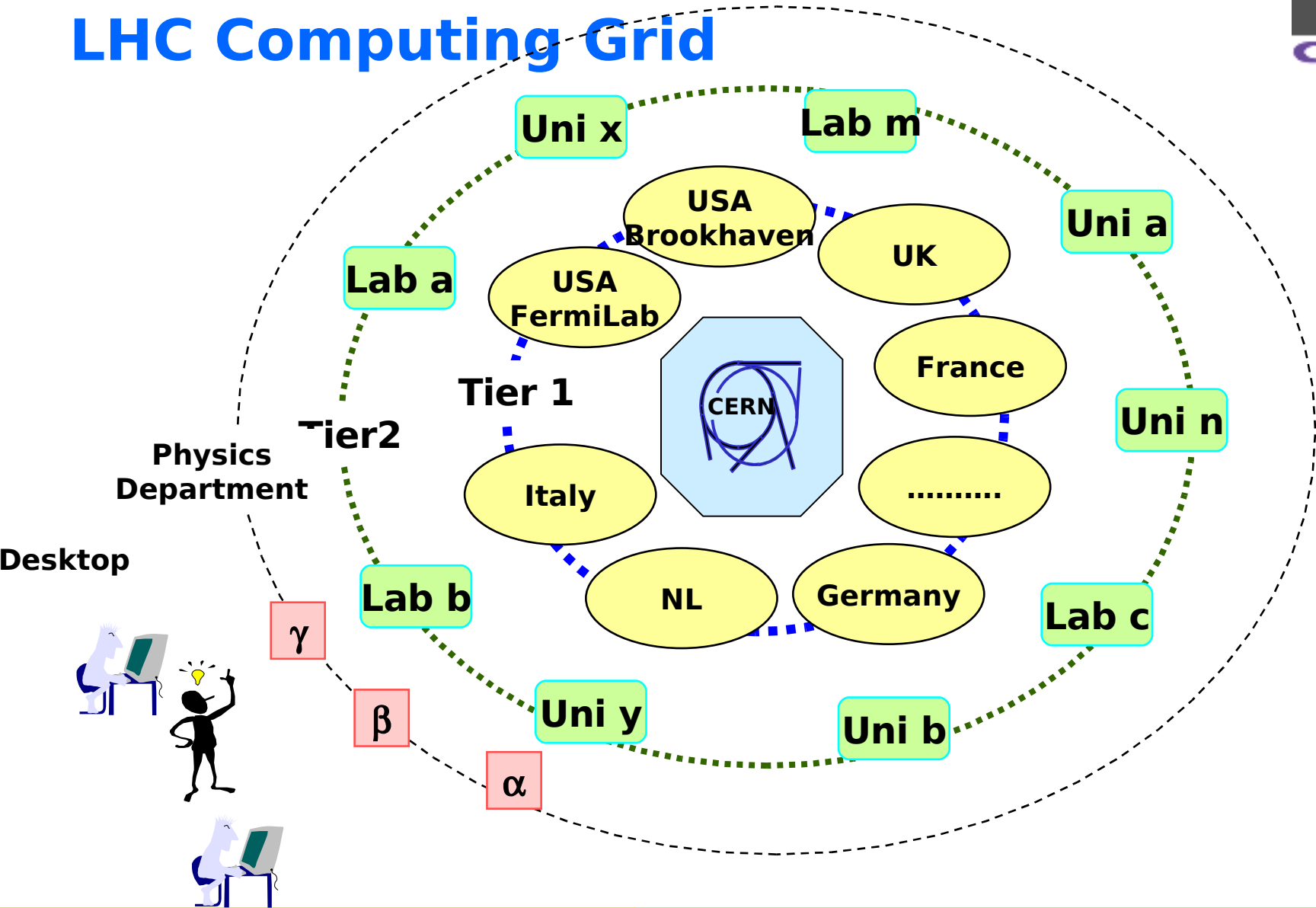
# Monarc model of Regional Centres



# Regional Centres - a More Realistic Topology !



# LHC Computing Grid




GridPP - The UK Grid for Particle Physics - Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Stop

Bookmarks Location: http://www.gridpp.ac.uk/ What's Related



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About GridPP

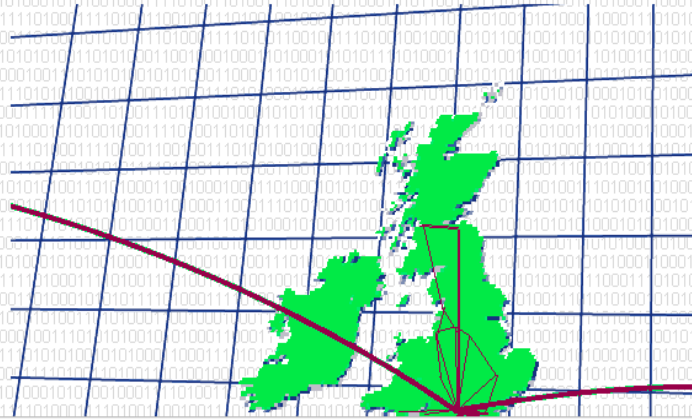
# The Grid for UK Particle Physics

## The GridPP Project

**GridPP is a collaboration of Particle Physicists and Computing Scientists from the UK and CERN, who are building a UK Grid for Particle Physics.**

The [Grid](#) refers to an infrastructure that enables the integrated, collaborative use of high-end computers, networks, databases, and scientific instruments owned and managed by multiple organizations.

**GridPP** will deliver the Grid software (middleware) and hardware infrastructure to enable testing of a prototype of the Grid for the [Large Hadron Collider](#) (LHC) project at [CERN](#) of significant scale. The **GridPP** project is designed to integrate with the existing Particle Physics programme within the UK, thus enabling early deployment and full testing of Grid technology and efficient use of limited resources. The project will disseminate **GridPP** deliverables in the multi-disciplinary e-Science environment and will seek to build collaborations with emerging Grid activities both nationally and internationally.



Document Done

Start My Computer Tera Term - a5.ph.gl... atd2k on 'ppehome' GridPP - The UK ... 18:38



## How will the UK participate?



- ◆ Tier1 (and Babar TierA) at RAL
- ◆ UK plans approx 4 Tier2 centres, not yet clear which
  - Candidates include Imperial/UCL/QMW, Manchester/Liverpool/Lancaster, Bristol, Cambridge, Oxford, Birmingham ScotGrid
  - Regional?
- ◆ Tier2 centres likely to be shared use of 1000+ node farms.

# UK Tier1/A Status 2003

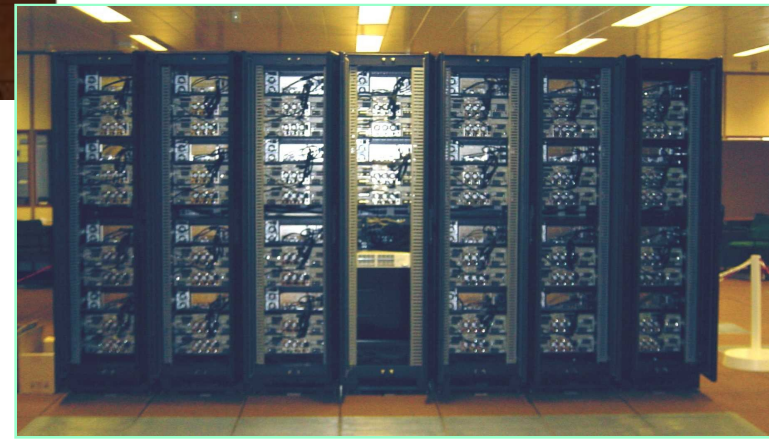


**Current EDG TB setup**  
14 Dual 1GHz PIII, 500MB  
RAM 40GB disks  
Compute Element (CE)  
Storage Element (SE)  
User Interfaces (UI)  
Information Node (IN)  
+ Worker Nodes (WN)



**+ Existing Central  
Facilities (Non Grid)**  
250 CPUs  
10TB Disk  
35TB Tape  
(Capacity 330 TB)

**Hardware Purchase installed March**  
156 Dual 1.4GHz 1GB RAM, 30GB disks (312 cpus)  
26 Disk servers (Dual 1.266GHz) 1.9TB disk each  
Expand the capacity of the tape robot by 35TB



# Projected Staff Effort [SY]



<u>Area</u>	<u>GridPP</u>	<u>@CERN</u>	<u>CS</u>
WP1 Workload Management	0.5 [IC]		2.0 [IC]
WP2 Data Management	1.5++ [Ggo]		1.0 [Oxf]
WP3 Monitoring Services	5.0++ [RAL, QMW]		1.0 [HW]
Security	++ [RAL]		1.0 [Oxf]
WP4 Fabric Management	1.5 [Edin., L'pool]		
WP5 Mass Storage	3.5++ [RAL, L'pool]		
WP6 Integration Testbed	5.0++ [RAL/M'cr/IC/Bristol]		
WP7 Network Services   2.0	[UCL/M'cr]		1.0 [UCL]
WP8 Applications	<b>17.0</b>		
ATLAS/LHCb (Gaudi/Athena)	6.5 [Oxf, Cam, RHUL, B'ham, RAL]		
CMS	3.0 [IC, Bristol, Brunel]		
CDF/D0 (SAM)	4.0 [IC, Ggo, Oxf, Lanc]		
BaBar	2.5 [IC, M'cr, Bristol]		
UKQCD	1.0 [Edin.]		
Tier1/A	13.0 [RAL]		
<b>Total</b>	<b>49.0++</b>	<b>10.0 -&gt; 25.0</b>	<b>6.0 = 80++</b>



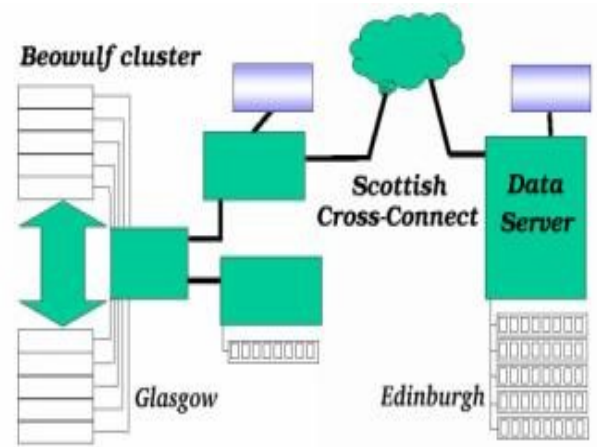
## Future Resources



- ◆ GridPP is a three year project
- ◆ We will spend similar amounts on hardware at the end of 2002 and 2003
  - But hope to get more for the money

## ScotGrid Processing nodes at Glasgow

- 59 IBM X Series 330 dual 1 GHz Pentium III with 2GB memory
- 2 IBM X Series 340 dual 1 GHz Pentium III with 2GB memory and dual ethernet
- 3 IBM X Series 340 dual 1 GHz Pentium III with 2GB memory and 100 + 1000 Mbit/s ethernet
- 1TB disk
- LTO/Ultrium Tape Library
- Cisco ethernet switches



## ScotGrid Storage at Edinburgh

- IBM X Series 370 PIII Xeon with 512 MB memory 32 x 512 MB RAM
- 70 x 73.4 GB IBM FC Hot-Swap HDD



## Griddev testrig at Glasgow

- 4 x 233 MHz Pentium II



## BaBar UltraGrid System at Edinburgh

- 4 UltraSparc 80 machines in a rack 450 MHz CPUs in each 4Mb cache, 1 GB memory
- Fast Ethernet and MirrorNet switching

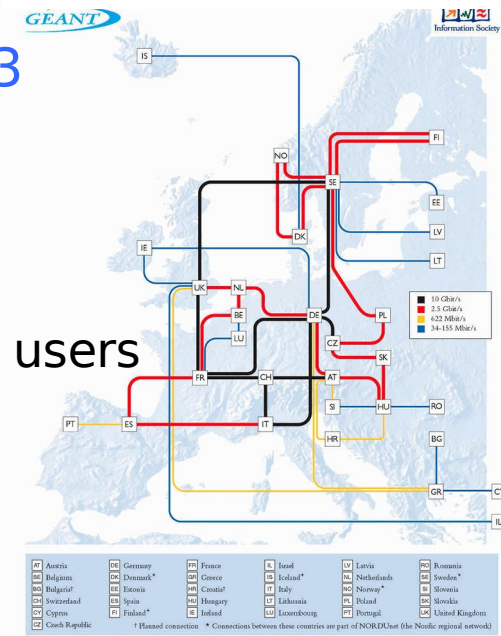
## CDF equipment at Glasgow

- 8 x 700 MHz Xeon IBM xSeries 370 4 GB memory 1 TB disk

One of (currently) 10  
GridPP sites running in  
the UK

# Network

- ◆ Tier1 internal networking will be a hybrid of
  - 100Mb to nodes of cpu farms with 1Gb up from switches
  - 1Gb to disk servers
  - 1Gb to tape servers
- ◆ UK academic network SuperJANET4
  - 2.5Gbit backbone upgrading to 20Gb in 2003
- ◆ RAL has 622Mb into SJ4
- ◆ SJ4 has 2.5Gb interconnect to Geant
- ◆ New 2.5Gb link to ESnet and Abilene just for research users
- ◆ UK involved in networking development
  - internal with Cisco on QoS
  - external with DataTAG

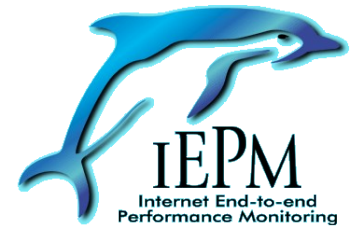




# Network Monitoring



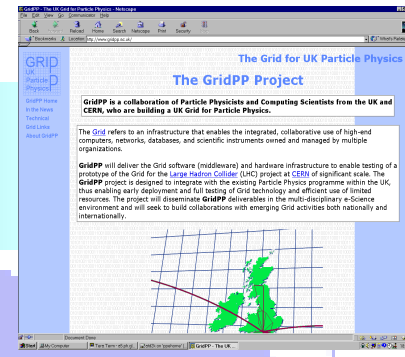
- ◆ RAL is part of HEP Network Monitoring Groups.
- ◆ Monitoring based on UK, SLAC, EDG, RIPE
- ◆ <http://icfamon.rl.ac.uk/>
- ◆ <http://www-iepm.slac.stanford.edu/>
- ◆ <http://ccwp7.in2p3.fr/mapcenter/>
- ◆ <http://www.ripe.net/cgi-bin/gttm/pod>



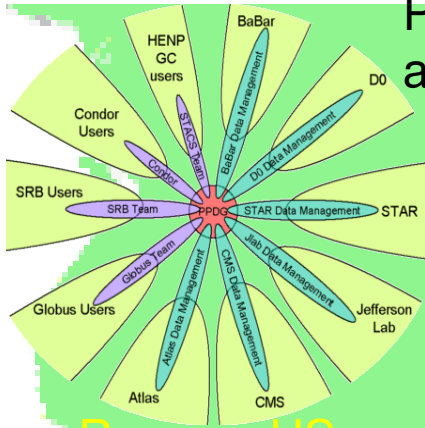
- ◆ UKHEP CA has been signing certificates since October 2000
  - Trusted by EDG
  - Trusted by DoE
    - ▲ recent transatlantic transfers by D0 between FNAL and UK publicised by PPDG as first external use of DoE CA
  
- ◆ UK Grid Support Centre setting up UK CA for UK eScience
  - based on OpenCA
  - HEP users will migrate to it over 2002



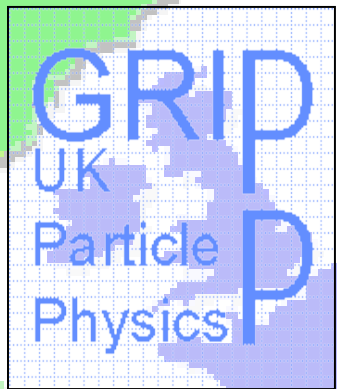
# GridPP Deployment



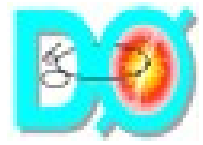
Provide **architecture** and **middleware**



Running US Experiments



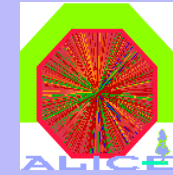
Future LHC Experiments



Use the Grid with **real data**

**Build Tier-A/prototype Tier-1 and Tier-2 centres in the UK and join worldwide effort to develop middleware for the experiments**

Use the Grid with **simulated data**

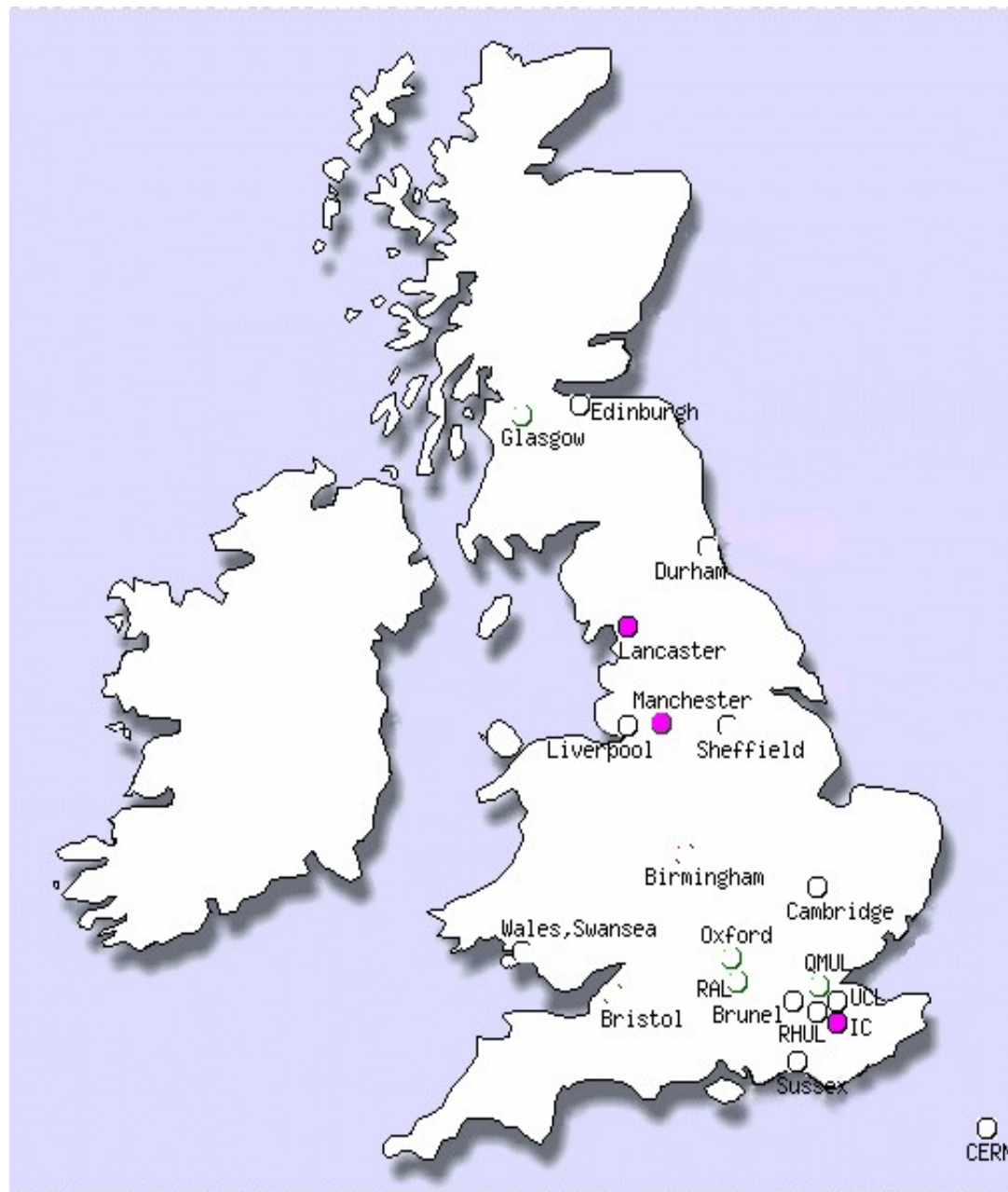
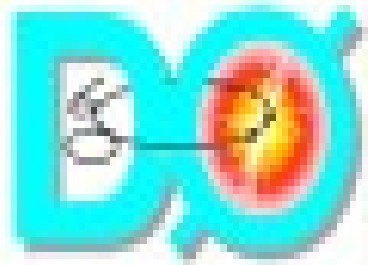


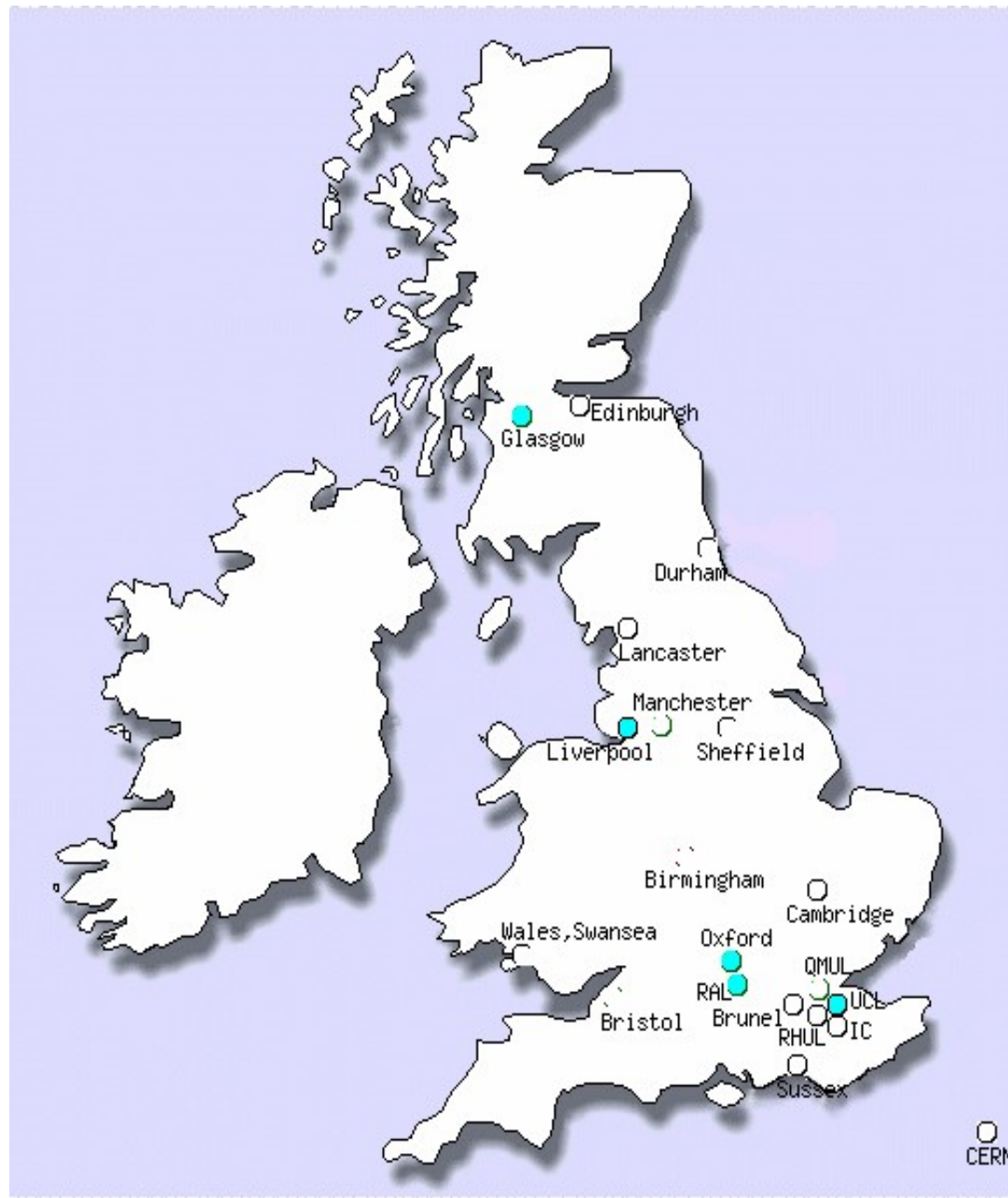
- ◆ RAL and Manchester in EDG TB1
- ◆ Expanding now to a core of 4 sites (Manchester, Bristol, Imperial, RAL) lead by Manchester
- ◆ EDG TB1 presence at most UK HEP sites over the next few months
- ◆ Expand RAL testbed to include production facilities if required
- ◆ Include substantial resources at other UK sites
- ◆ ...including non-HEP Centres

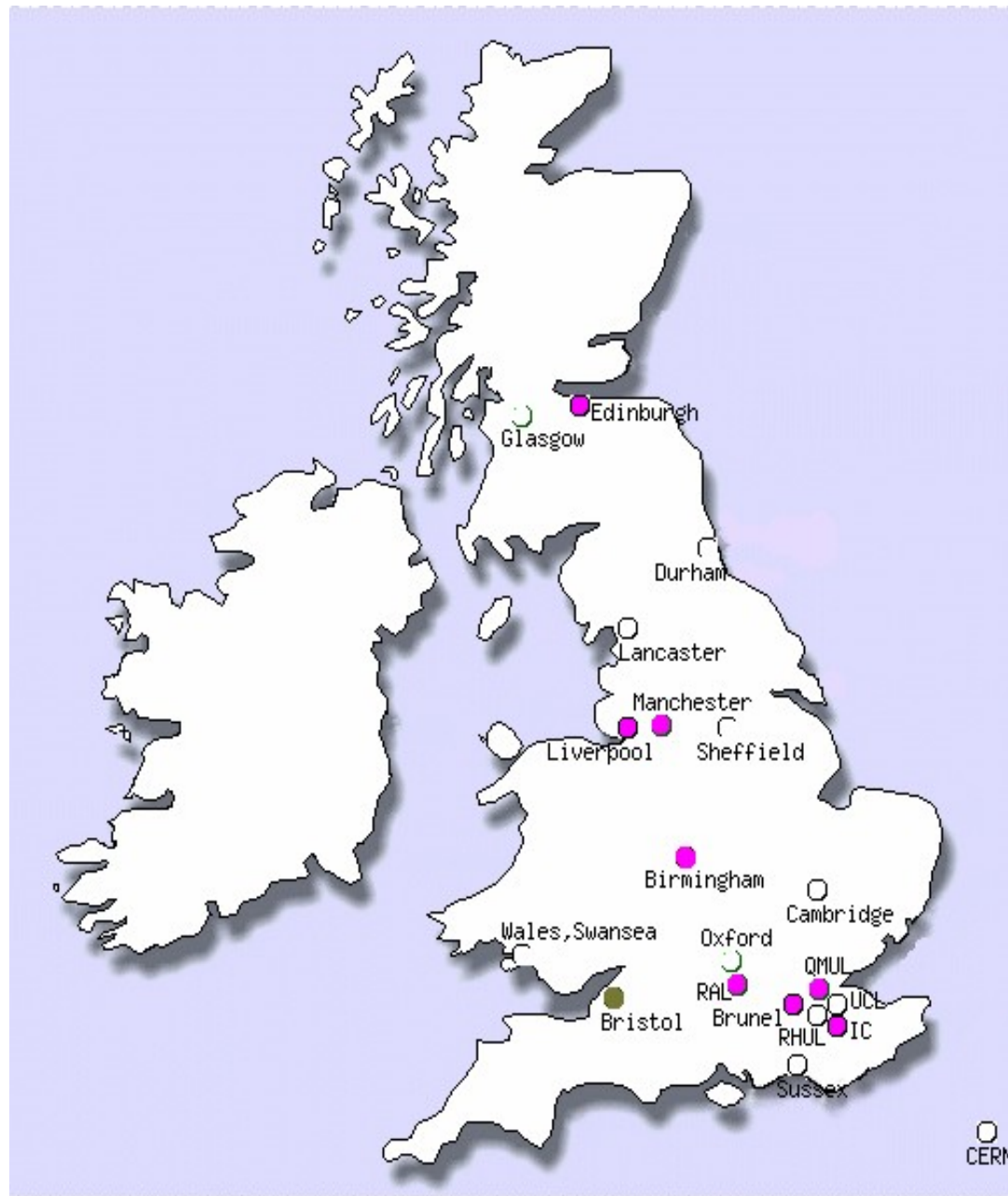
## Other Grid Deployment



- ◆ But GridPP will not just be EDG Testbed







# Planned Testbed Use



## ◆ Testbeds

- EDG testbed1, 2, 3
- EDG development testbed,
- DataTAG/GRIT/GLUE
- LCG testbeds
- other UK testbeds

## ◆ Data Challenges

- Alice, Atlas, CMS, and LHCb confirmed they will use RAL

## ◆ Production

- BaBar and others

# Short-term Plans



- ◆ Integrate Resources as closely as possible
  - To avoid different hardware/software for different VOs
  - This could be difficult (eg RH6/7 and Objectivity) and different grid projects
- ◆ Start with existing infrastructure, develop EDG testbeds on the side
- ◆ Move cpu and disk around logically, not physically
- ◆ Provide additional front-ends where required
- ◆ Move existing experiments to grid-based tools
  - E.g. for remote job submission



## Involvement in GRID MW projects



- ◆ EDG
- ◆ DataTAG
- ◆ BaBar Grid
- ◆ SAM
- ◆ Gaudi

### EDG - UK Contributions

Architecture  
Testbed-1  
Network Monitoring  
Certificates & Security  
Storage Element  
R-GMA  
LCFG  
MDS deployment  
FTREE  
GridSite  
SlashGrid  
Spitfire...

# Experiment Grid Deployment



Current MDS Data from ldap://babargrid.phy.bris.ac.uk:21



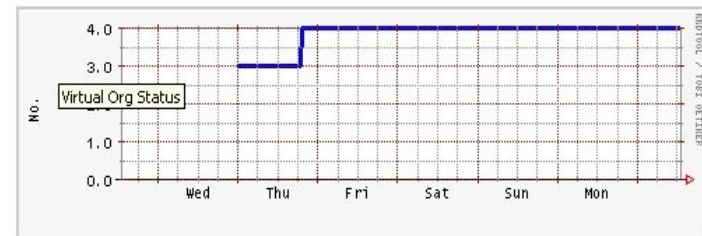
## Total Statistics

Simulation Mixer Reco Total

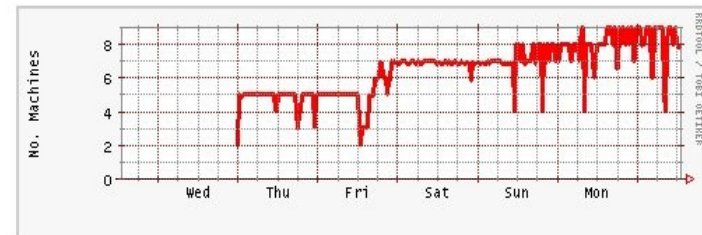
Running	23	6	46	75
Pending	488	48	38	574
Total	511	54	84	649



## Total Number of VO's Online



## Total Number of Machines Online



## Summary



- ◆ UK will put substantial resources into building a Grid for Particle Physics.
- ◆ Tier1 at RAL and several Tier2s will form the backbone of a grid which will reach into all PP groups and other national centres.
- ◆ This grid will be the main source of UK computing resources for the next few years
- ◆ And it will be used as part of many grid projects.