

CERN



openlab for DataGrid applications

Presentation of the Grid activities at CERN

*Visit of Dr. Eli Opper,
Research and Development Chief Scientist
Ministry of Industry and Trade, Israel
Wednesday 18 February 2004*





LHC data

- 40 million collisions per second
- After filtering, 100 collisions of interest per second
- A Megabyte of data digitised for each collision
= recording rate of 0.1 Gigabytes/sec
- 10^{10} collisions recorded each year
= 10 Petabytes/year of data

1 Megabyte (1MB)
A digital photo

1 Gigabyte (1GB)
= 1000MB
A DVD movie

1 Terabyte (1TB)
= 1000GB
World annual book production

1 Petabyte (1PB)
= 1000TB
Annual production of one LHC experiment

1 Exabyte (1EB)
= 1000 PB
World annual information production

CMS



LHCb



ATLAS



ALICE

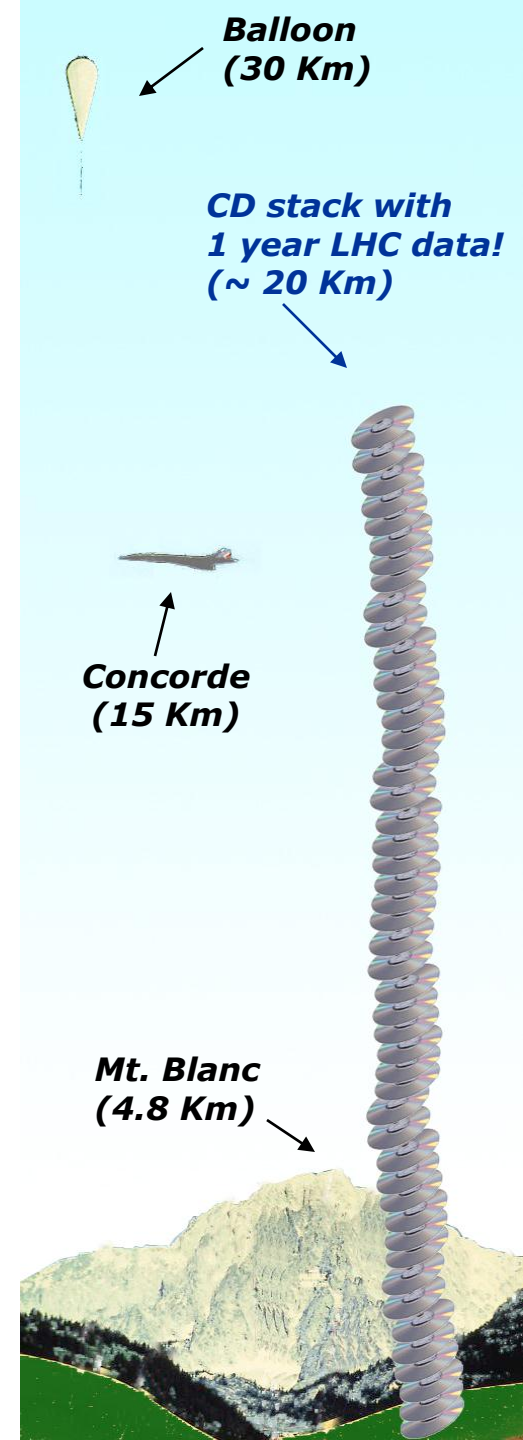




LHC data

**LHC data correspond to about
20 million CDs each year**

**Where will the
experiments store all of
these data?**

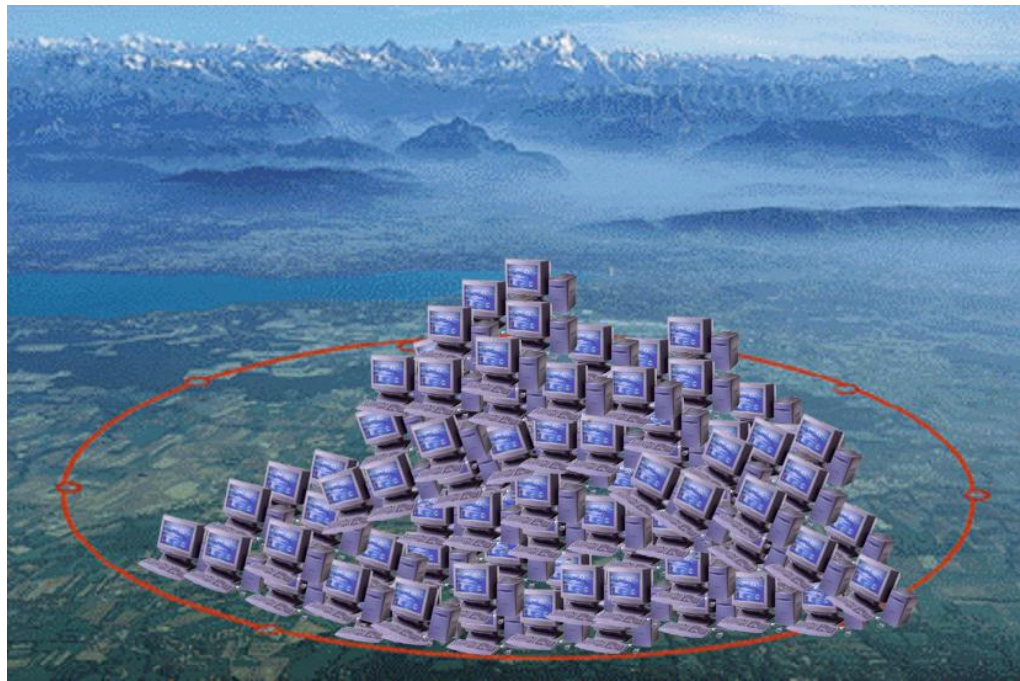




LHC processing

LHC data analysis requires a computing power equivalent to ~ 100,000 of today's fastest PC processors

Where will the experiments find such a computing power?





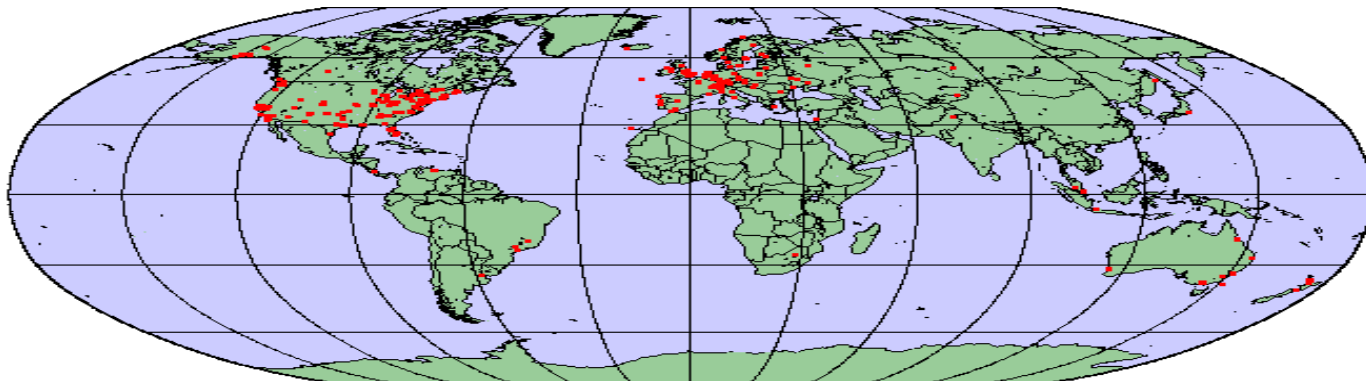
Computing for LHC

- **Problem:** even with Computer Centre upgrade, CERN can provide only a fraction of the necessary resources

- **Solution:** Computing centers, which were isolated in the past, will be connected, **uniting the computing resources of particle physicists worldwide**

Europe:
267 institutes
4603 users

Elsewhere:
208 institutes
1632 users





What is the Grid?

- The **World Wide Web** provides seamless access to information that is stored in many millions of different geographical locations
- In contrast, the **Grid** is an emerging infrastructure that provides seamless access to computing power and data storage capacity distributed over the globe.





Grid @ CERN

- CERN projects:
LHC Computing Grid (LCG)
- EC funded projects led by CERN:
Enabling Grids for E-Science in Europe (EGEE)
European DataGrid (EDG)
European DataTAG (EDT)
+others
- Industry funded projects:
CERN openlab for DataGrid applications





LHC Computing Grid (LCG)

Timeline:

- 2002: start project
- 2003: service opened LCG-1 went online in September
- 2004: LCG-2 deployed on >25 centres contributing, first industrial provider announced (HP)
- 2002 - 2005: deploy the environment for LHC computing
- 2006 – 2008: build and operate the LHC computing service



Sites include: Academia Sinica Taiwan, BNL, CERN, CNAF, FNAL, FZK, IN2P3 Lyon, FKI Budapest, Moscow State Uni., Prague, PIC Barcelona, RAL, Uni. Tokyo



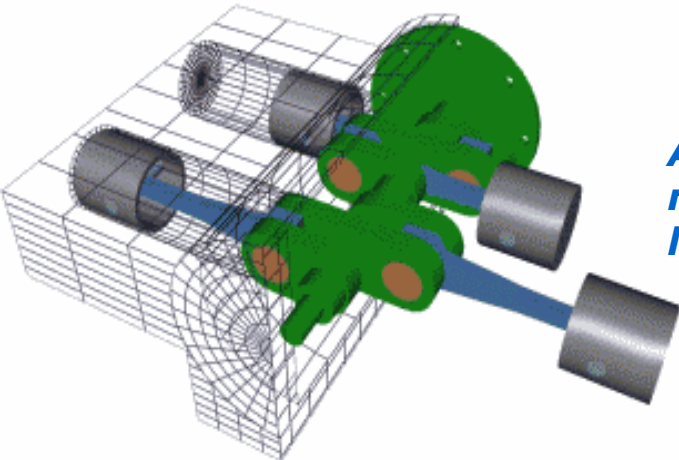


The EGEE Vision

EGEE
Enabling Grids for
E-science in Europe

Access to a production quality GRID will change the way science and much else is done in Europe

An international network of scientists will be able to model a new flood of the Danube in real time, using meteorological and geological data from several centers across Europe.



A team of engineering students will be able to run the latest 3D rendering programs from their laptops using the Grid.

A geneticist at a conference, inspired by a talk she hears, will be able to launch a complex biomolecular simulation from her mobile phone.





DataTAG

Internet2 Landspeed Record at Telecom 2003:

From Starlight in Chicago to CERN in Geneva,
1.1TeraByte of data across 7'067 km in less than 30min.
at TCP rate of 5.44 Gbps (= 38,420.54 petabit-meters/sec)

This speed record is equivalent to:

Transferring a full 680 Mbytes CD in 1 second

Transferring 450 full length DVD movies in one hour

(i.e. 1 DVD in 8 seconds)



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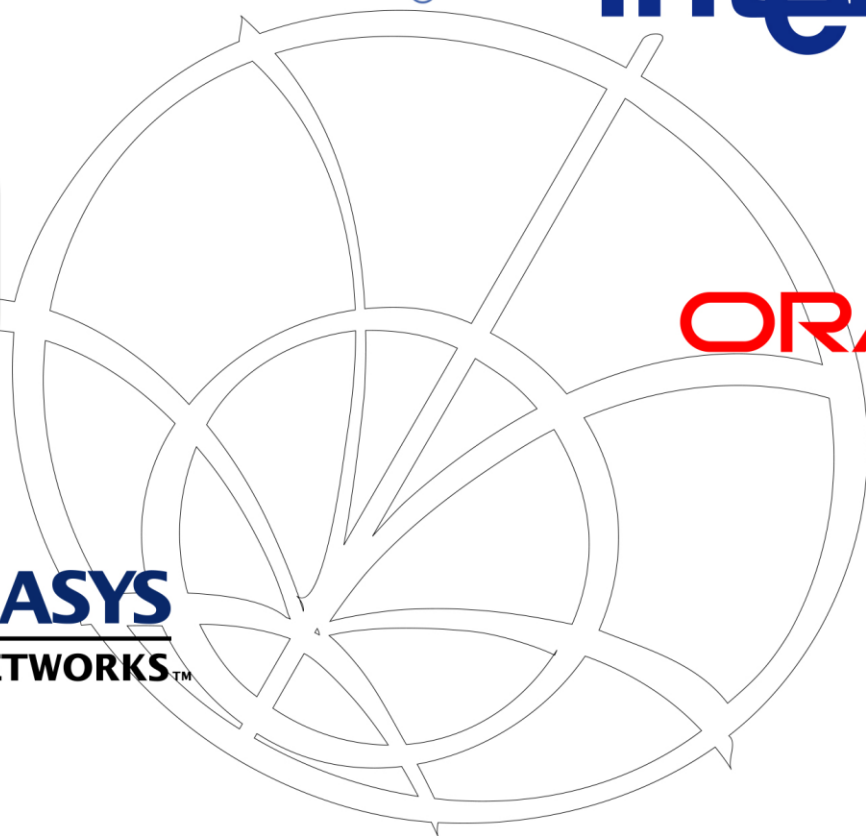


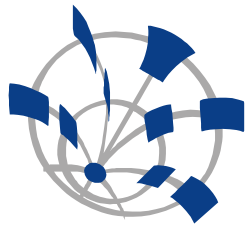
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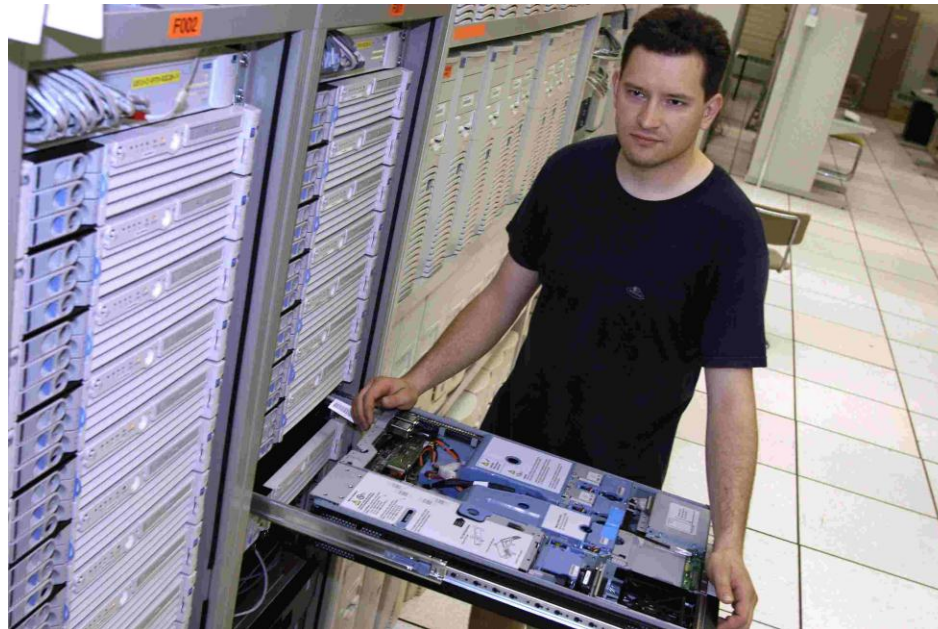


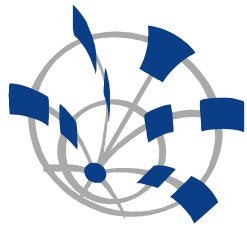


The CERN opencluster

Objectives

- Build an ultrahigh performance computer cluster
- Link it to the DataGrid and test its performance
- Evaluate potential of future commodity technology for LCG





Joining the openlab

Sponsorship = 1.5Meuro / 3 years, can be:

- In-kind donations (list price)
- Dedicated staff (200keuro/year)
- CERN fellowships (80keuro/year)
- Training and support (market rate)
- Specific CERN openlab events
- Other Grid-related PR activities

Since 2003 "Contributor" status exists:
Discussions with Voltaire (Israel) ongoing
Benefits are CERN as testbed and reference

IBM delegation at
openlab Annual Sponsors
Meeting, June 2003

