

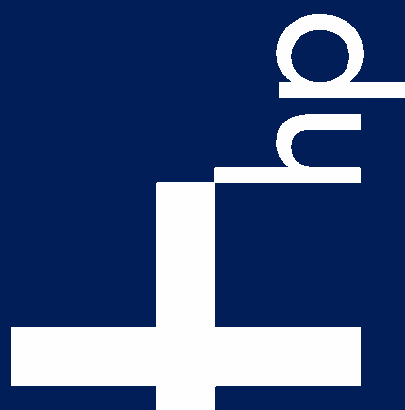


CERN & HP & Computing

Dr John Manley
Hewlett-Packard Laboratories, Bristol

27th May, 2004

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The Next 20 Minutes

- Some context
- A little bit of history
- Some assertions
- CERN Grid OpenLab/LCG
- A quick summary

John Taylor*: Motivation for e-Science

e-science

will drive the next generation of technology
for

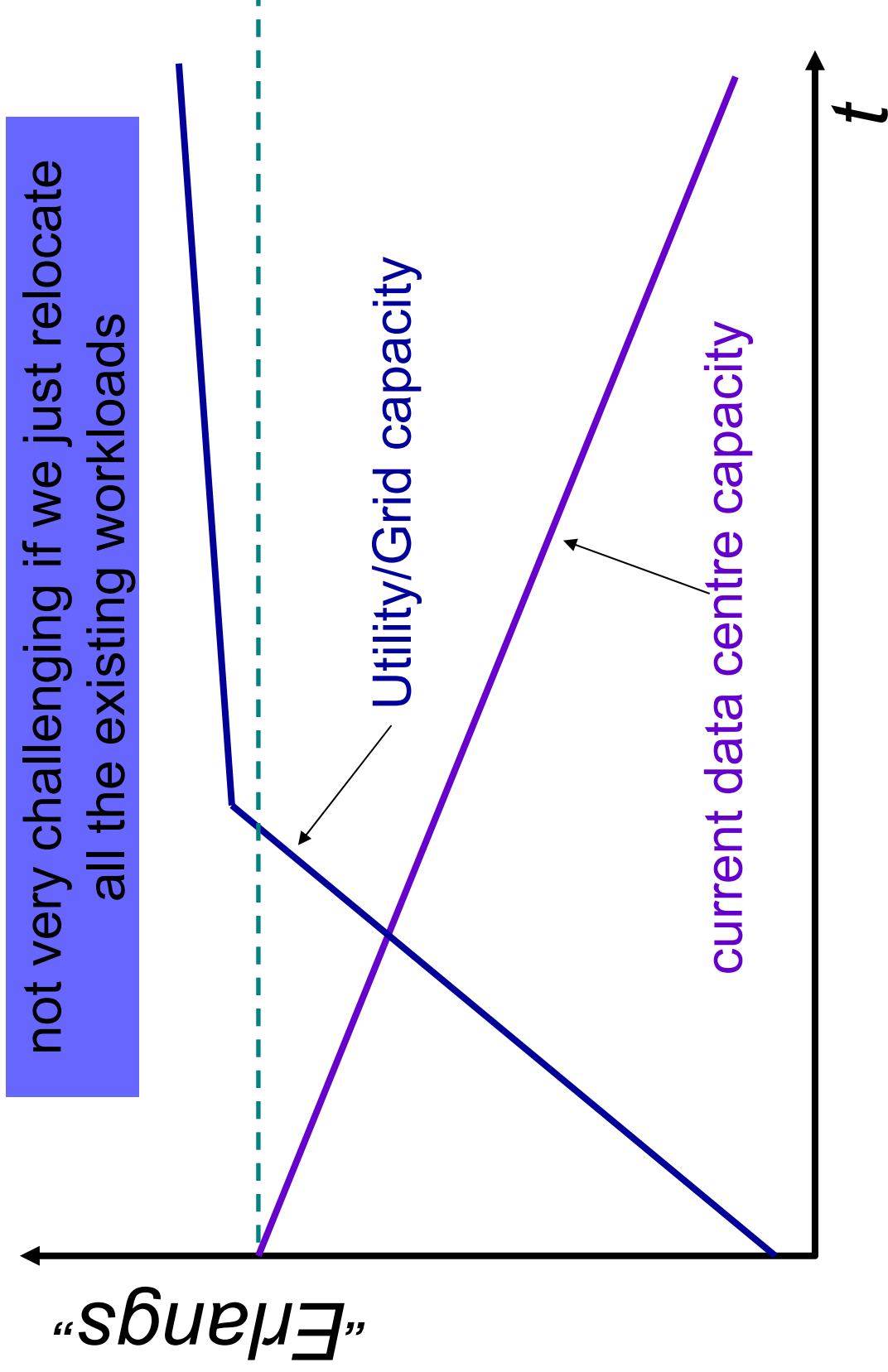
*e-commerce, e-business, e-engineering
e-auctions e-health, e-education, e-university
e-democracy, e-community, e-family*

e-.....

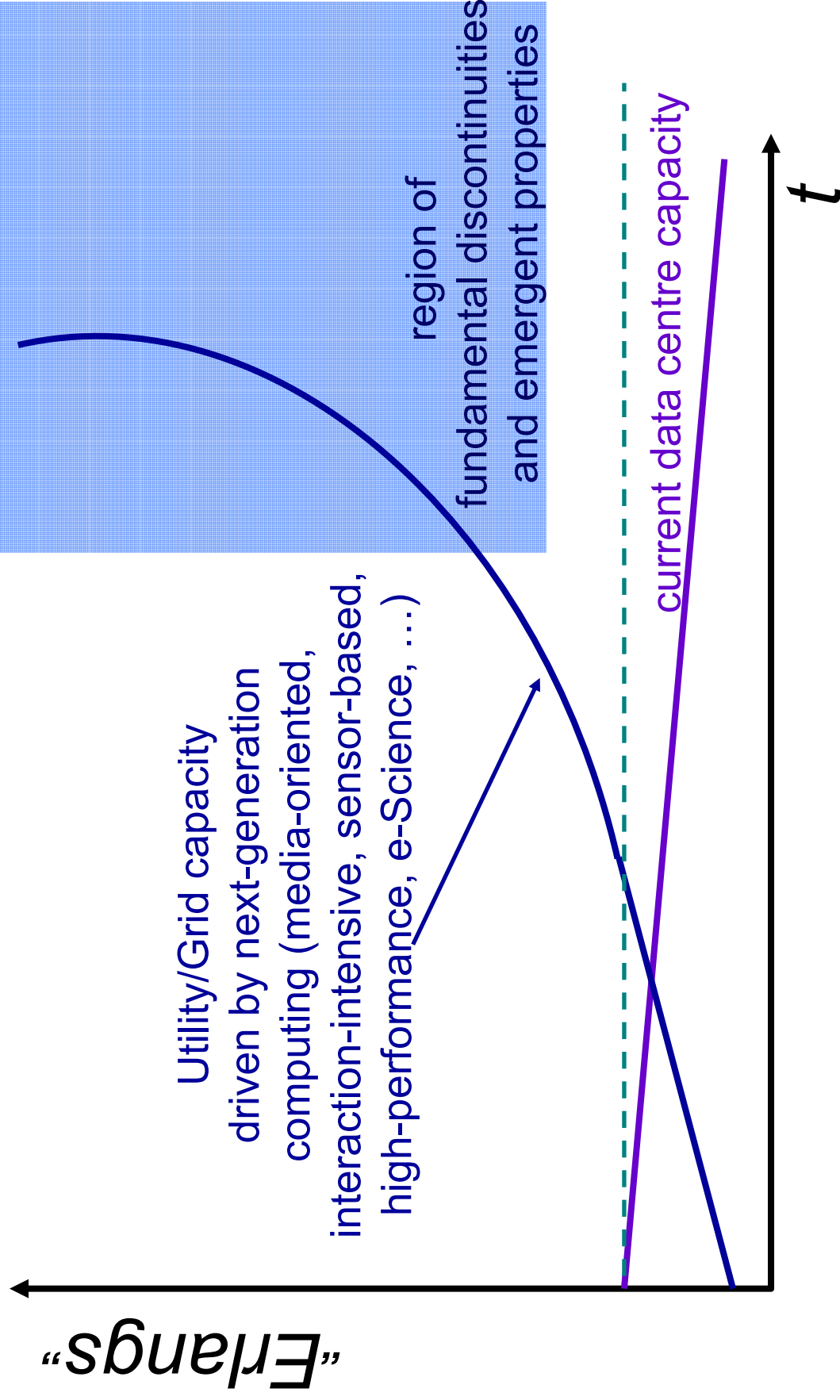


* DG UK Research Councils 1999-2003

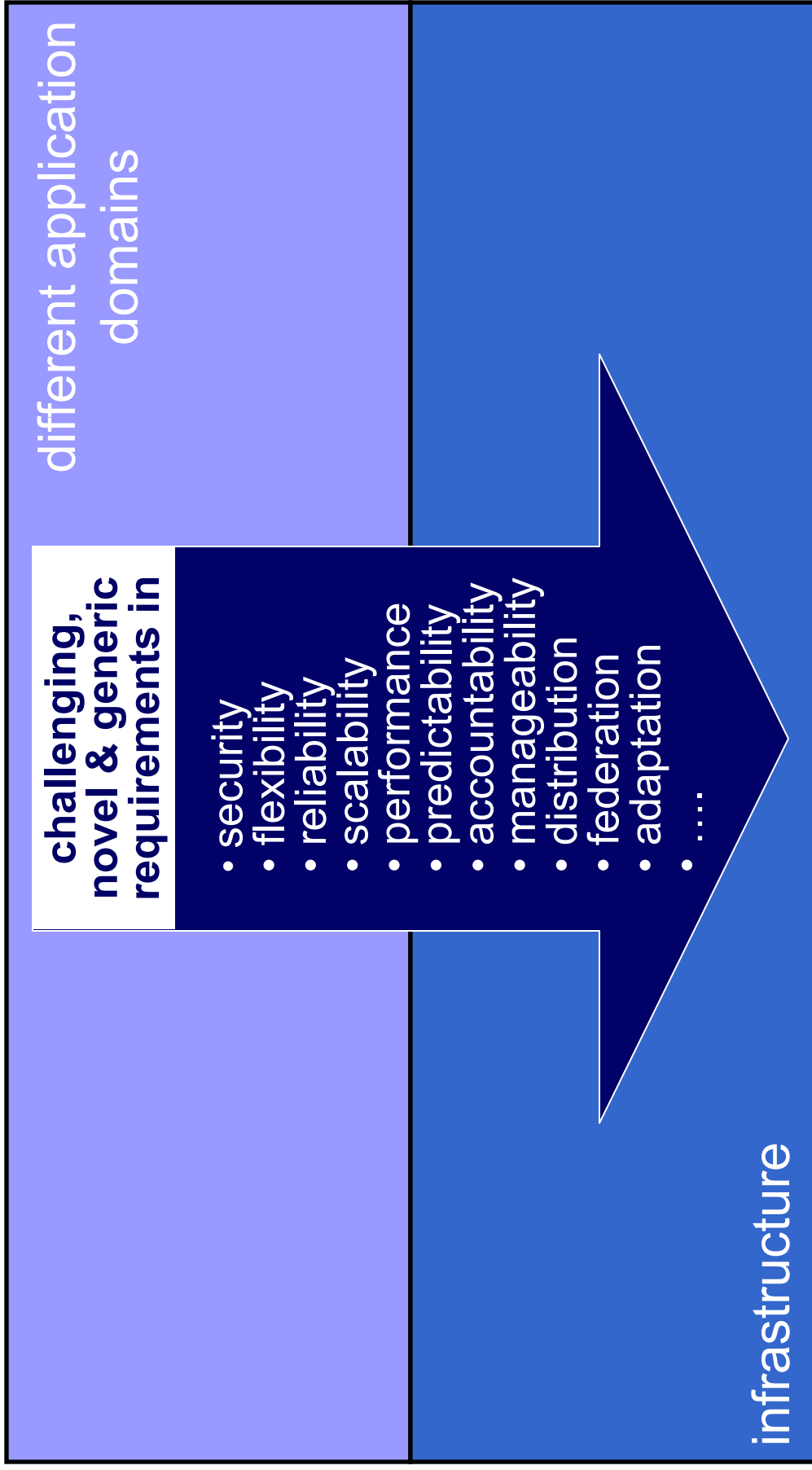
The Road to Utility/Grid Computing



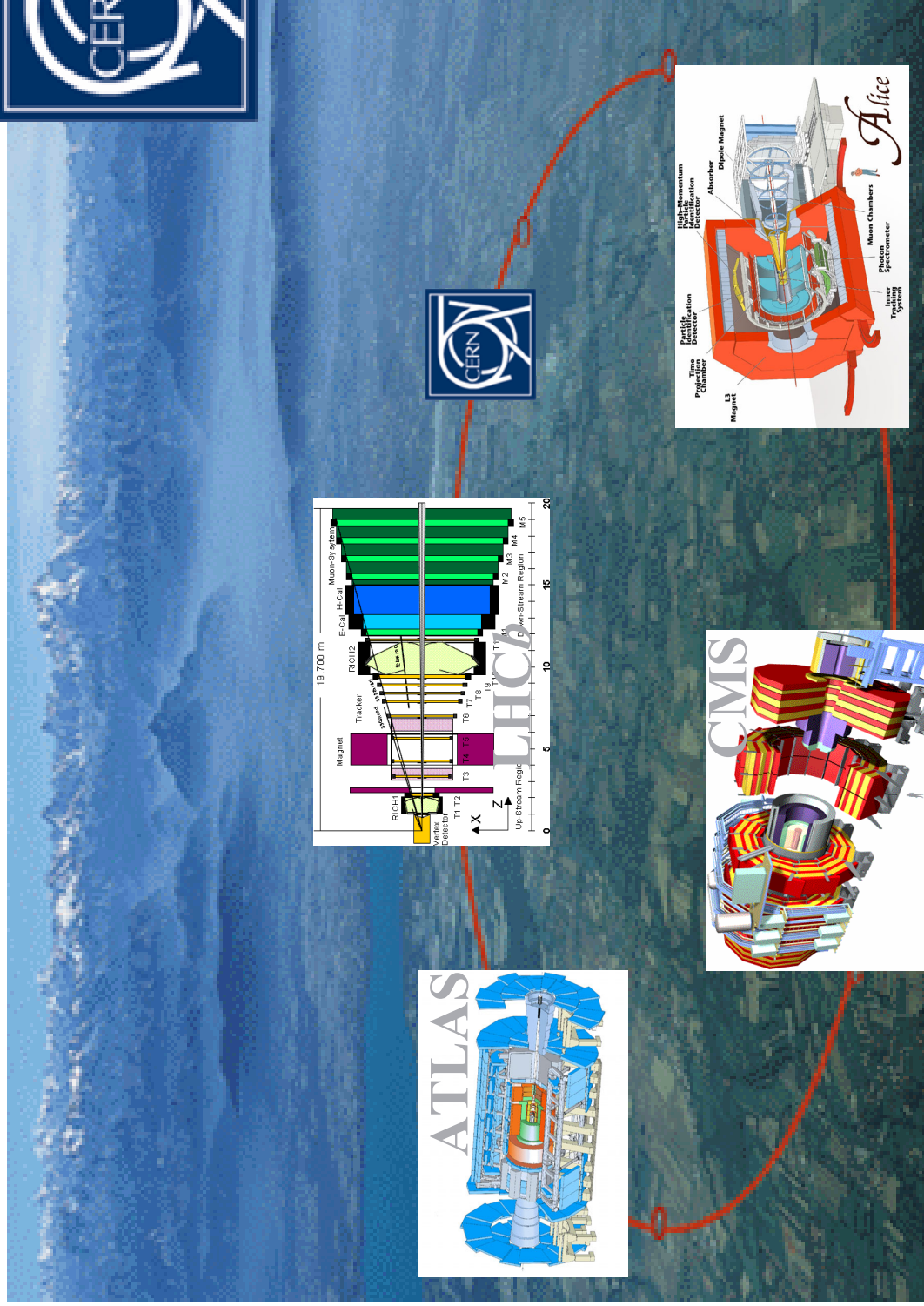
The Real Driver . . .



What can we learn?



One Demanding Place to Learn



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In the 80's

- OpenView
- Move rese
- CERN had
- They were
- Major succ
- Verification
- Successes
- Four HPLa
- collaboration

And incidentally . . .

systems management

135,000 total installations

Used by 100% of the Fortune 50

10 of 10 largest US-based ISPs managed

19 million online customers managed

4 million online trading and bank accounts managed

67% of US-based Internet Service Providers

70% of Internet devices managed

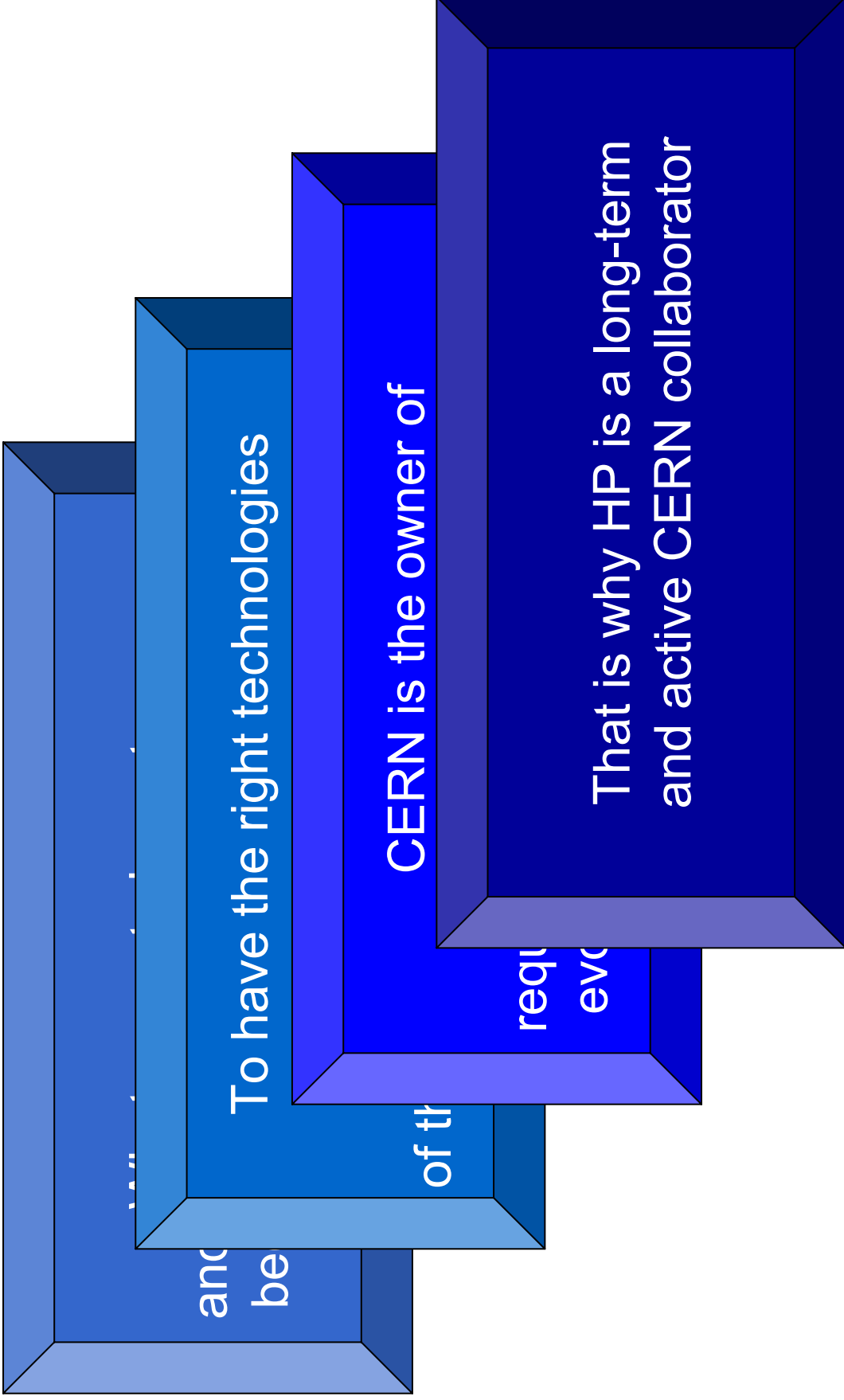
1,000 installations in wireline and wireless networks



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Some Assertions



Some Assertions //

They have a real and pressing
task to execute

em,

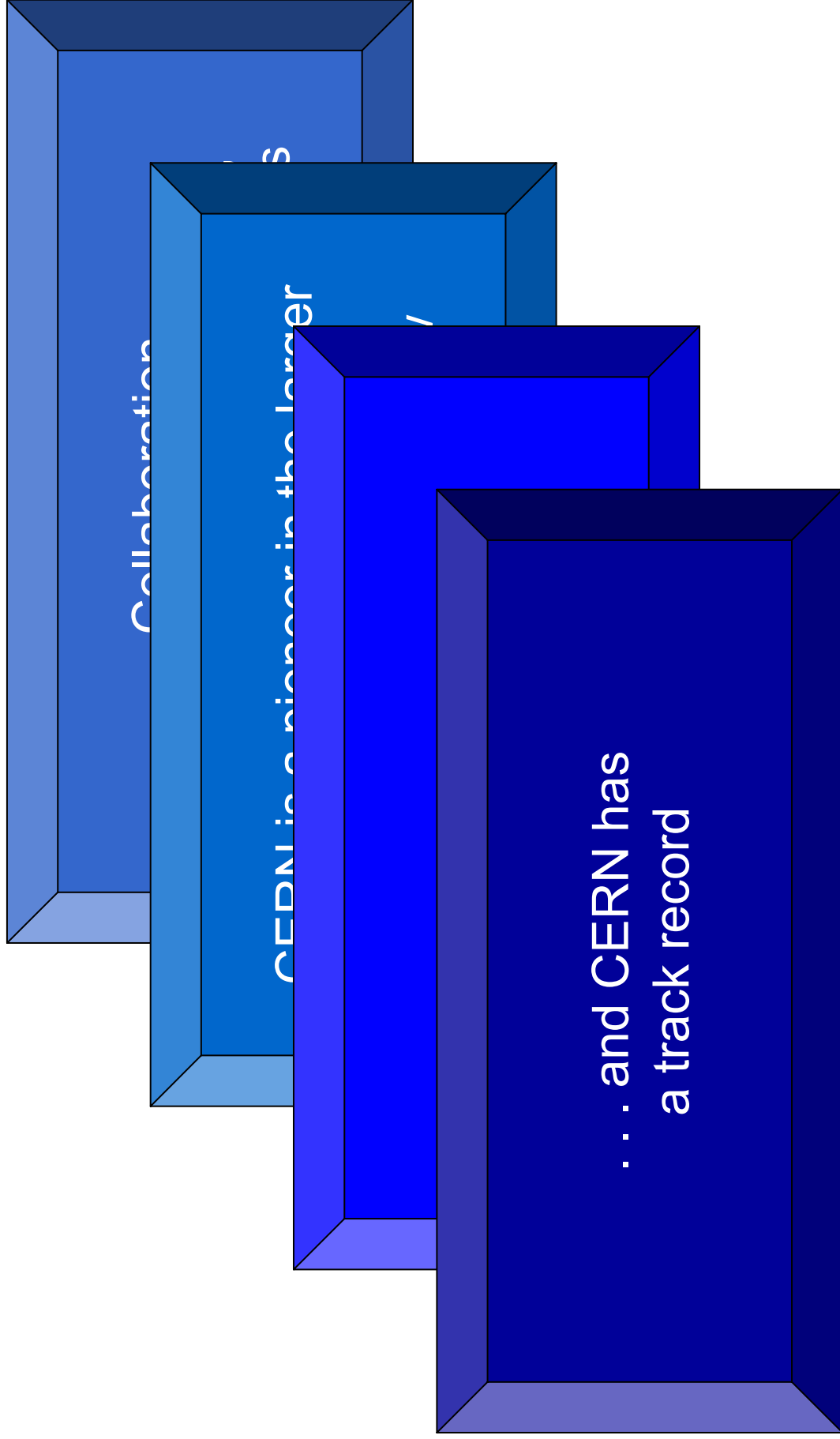
what you

rs

to system architects and
implementors

things will happen in 3 months

Some Assertions ///



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The CERN opencluster

Objectives

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

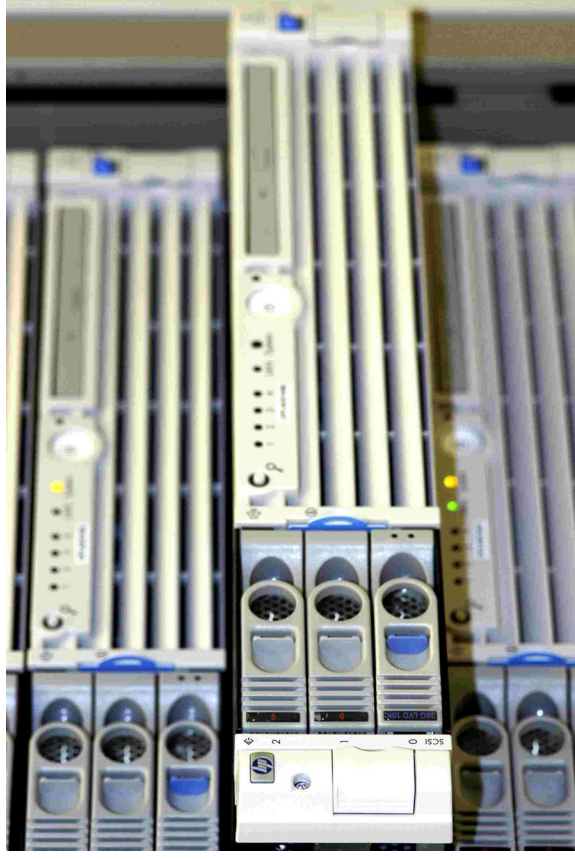




The CERN opencluster

Sponsorship so far

- >100 Intel Itanium™ processors (64-bit technology) and network cards
- HP servers in a 50-node cluster & development machines
- Three 10-Gbit/s switches from Enterasys Networks
- Dedicated R&D staff from industrial partners
- Funding for two CERN post-doctoral fellows by HP





CERN opencuster and data challenges

Example

GB/s storage-to-tape record

1.1 GB/s for hrs, peaks of 1.2 GB/s

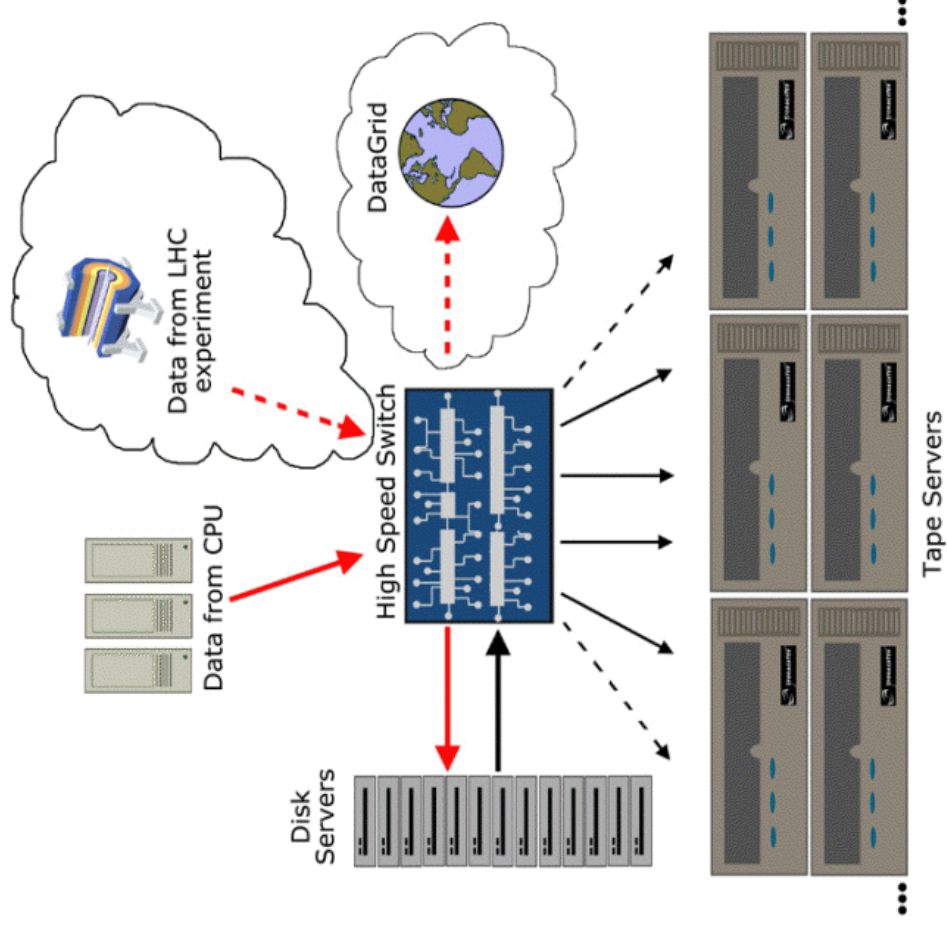
Corresponds to data rates from LHC

45 StorageTek tape drives in parallel

Role of CERN opencuster

Cluster nodes for temporary storage

Cluster switch plays central role



opencluster in
the record
books

**Itanium-2
single stream:
5.44 Gbps
1.1 TB in 30 mins**

CNN.com.

 Click to Print

New Internet speed record set

GENEVA, Switzerland (Reuters) -- Two major scientific research centres said on Wednesday they had set a new world speed record for sending data across the Internet, equivalent to transferring a full-length DVD film in seven seconds.

The European Organisation for Nuclear Research, CERN, said the feat, doubling the previous top speed, was achieved in a newly 30-minute transmission over 7,000 kms of network between Geneva and a partner body in California.

CERN, whose laboratories straddle the Franco-Swiss border near Geneva, said it had sent 1.1 Terabytes of data at 5.44 gigabits a second (Gbps) to a lab at the California Institute of Technology, or Caltech, on October 1.

This is more than 20,000 times faster than a typical home broadband connection, and is also equivalent to transferring a 60-minute compact disc within one second -- an operation that takes around eight minutes on standard broadband.

Using current technology, a DVD -- or digital video disc -- film of some 90 minutes' length takes some 15 minutes to download from the Internet.



Organisation Européenne pour la Recherche Nucléaire
European Organization for Nuclear Research

PR15.03
15.10.2003

CERN and Caltech join forces to smash Internet speed record

CERN* and California Institute of Technology (Caltech) will tomorrow receive an award for transferring over a Terabyte of data across 7,000 km of network at 5.44 gigabits per second (Gbps), smashing the old record of 2.38 Gbps achieved in February between CERN in Geneva and Sunnyvale in California by a Caltech, CERN, Los Alamos National Laboratory and Stanford Linear Accelerator Center team.

The international CERN-Caltech team set this new Internet2® Land Speed Record on 1 October 2003 by transferring 1.1 Terabytes of data in less than 30 minutes, corresponding to 38,420.54 petabit-metres per second. The average rate of 5.44 Gbps is more than 20,000 times faster than a typical home broadband connection and is equivalent to transferring a full CD in 1 second or a full length DVD movie in approximately 7 seconds. The award will be made to Olivier Martin of CERN and Harvey Newman of Caltech on the Lake Geneva Region Stand at the [ITU Telecom World event](#) in Geneva live from the Internet2 conference in Indianapolis at [17:30CET on Thursday 16 October](#).

Why is HP participating in the CERN LCG?



LCG is an operational Grid:

- LCG is one of the first Operational Grids (24x7)
- Operations have started this year involving about 20 sites
- Bottom-up approach in software (LCG2 is now stable)
- Pragmatic view with milestones in 2004 and 2006
- Total supply capacity: 100,000 PCs with 20 PB data
- Several applications targeted to run on EGEE/LCG:
Physics, Bio Informatics, Digital Media, Digital Publishing

HP participation in LCG




- HP contributions to LCG:
 - Nodes (Puerto Rico, Brazil, Palo Alto, Bristol)
 - Software tools (Grid, Market SW for resource allocations, etc.)
 - Manpower for tests and operations
 - Scale-up potential in Singapore, China and other geographies
- Possibility to run industrial applications on LCG:
 - Digital Media (Rendering, ...)
 - Digital Publishing
 - BioInformatics
- LCG has a potential leadership play in Grid software (bottom-up approach for de-facto standard)

64-bit porting status

- Ported:
 - **Castor** (data management subsystem)
 - GPL. Certified by authors.
 - **ROOT** (C++ data analysis framework)
 - Own license. Binaries both via gcc and ecc. Certified by authors.
 - **CLHEP** (class library for HEP)
 - GPL. Certified by maintainers.
 - **GEANT4** (C++ Detector simulation toolkit)
 - Own license. Certified by authors.
 - **CERNLIB** (all of CERN's FORTRAN software)
 - GPL. In test.
 - Zebra memory banks are l*4
 - **ALIROOT** (entire ALICE software framework)
 - **LCG-2 software** from VDT/EDG
 - GPL-like license.
- Being ported:
 - **CMS ORCA** (part of CMS framework)

January 27th, 2004



	<p>News release</p>
	<p>HP Becomes First Commercial Member of CERN Large Hadron Collider Computing Grid HP resources to be part of operational version of CERN's massive computing project to manage, analyze research data</p> <p>PALO ALTO, Calif., Jan. 27, 2004 – HP (NYSE:HPQ) today announced it will support an operational grid for the Large Hadron Collider (LHC) at CERN, the European Laboratory for Particle Physics.</p> <p>The LHC, the world's largest scientific instrument, enables research into the fundamental nature of matter. It is in the final stages of construction at CERN's facility outside Geneva.</p>

HP Becomes First Commercial Member of CERN Large Hadron Collider Computing Grid



HP resources to be part of operational version of CERN's massive computing project to manage, analyze research data
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HP will link computing resources at its HP Labs locations in Palo Alto and Bristol (U.K.) as well as HP Brazil and HP Puerto Rico to CERN's LHC Computing Grid (LCCG) to help manage and analyze the massive quantities of data expected to be produced by the facility. (40 Academic sites already participating).



Organisation Européenne pour la Recherche Nucléaire
European Organization for Nuclear Research



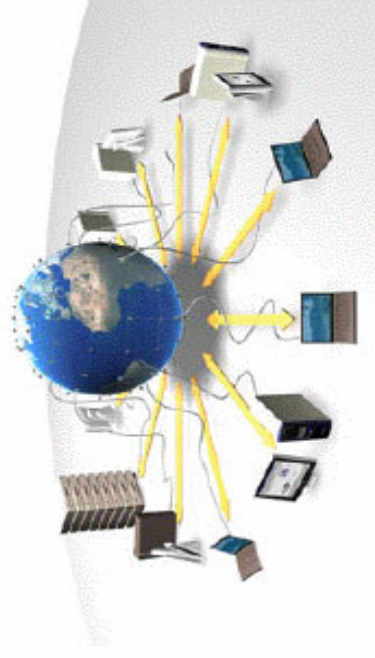
Press Release

PR13.03
29.09.2003



Renovation of the Computer
Centre at CERN at this moment
which "looks like a grid" ...

LHC Computing Grid Goes Online



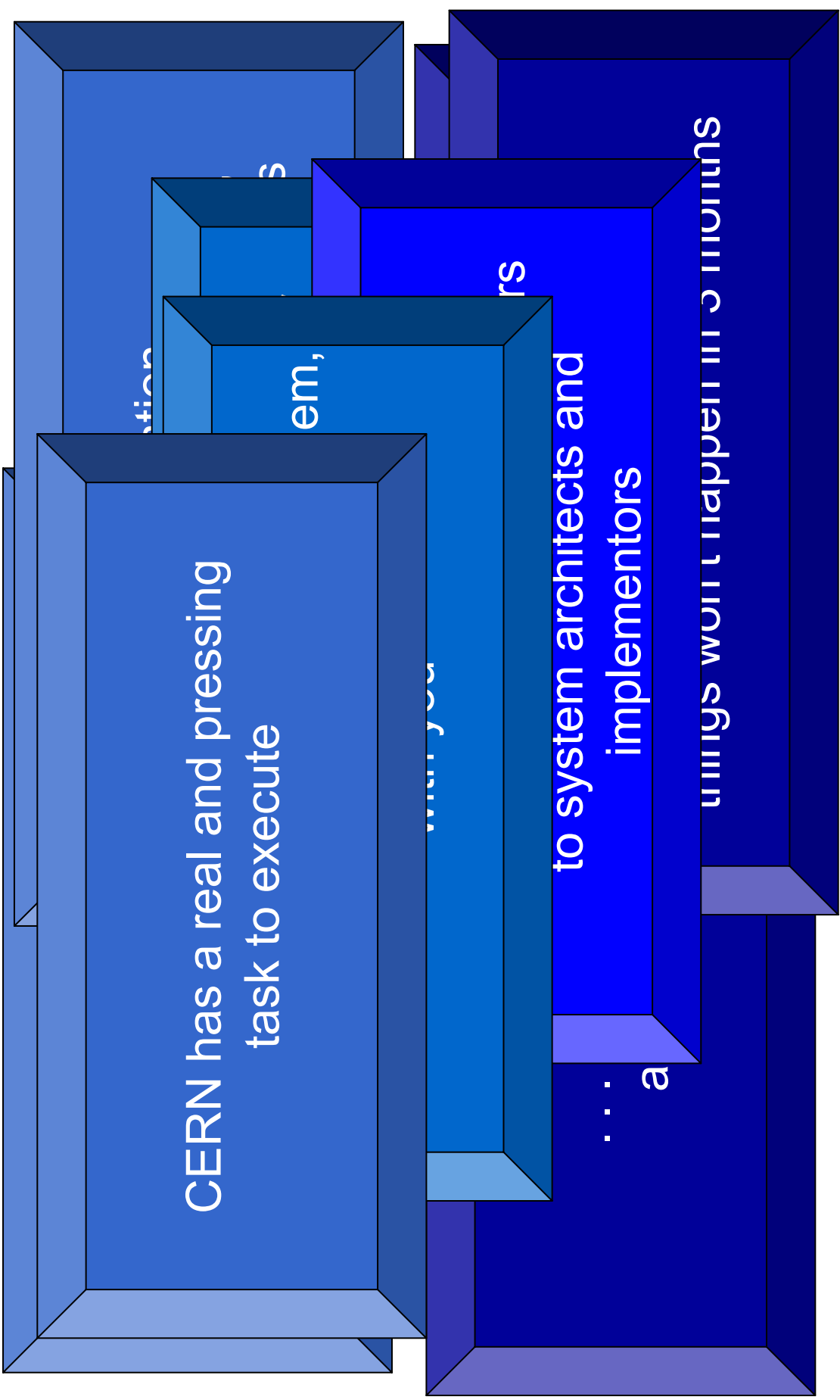
The world's particle physics community today announced the launch of the first phase of the LHC computing Grid (LCG). The LCG is designed to handle the unprecedented quantities of data that will be produced by experiments at CERN's Large Hadron Collider (LHC) from 2007 onwards.

"The LCG will provide a vital test-bed for the new Grid computing technologies that are set to revolutionise the way scientists use the world's computing resources in areas ranging from fundamental research to medical diagnosis," said Les Robertson, CERN's LCG project manager.

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Summary





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