



# Grid Infrastructure for the ILC



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DESY

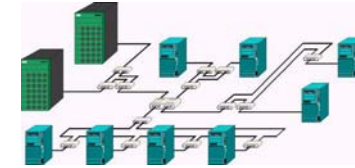
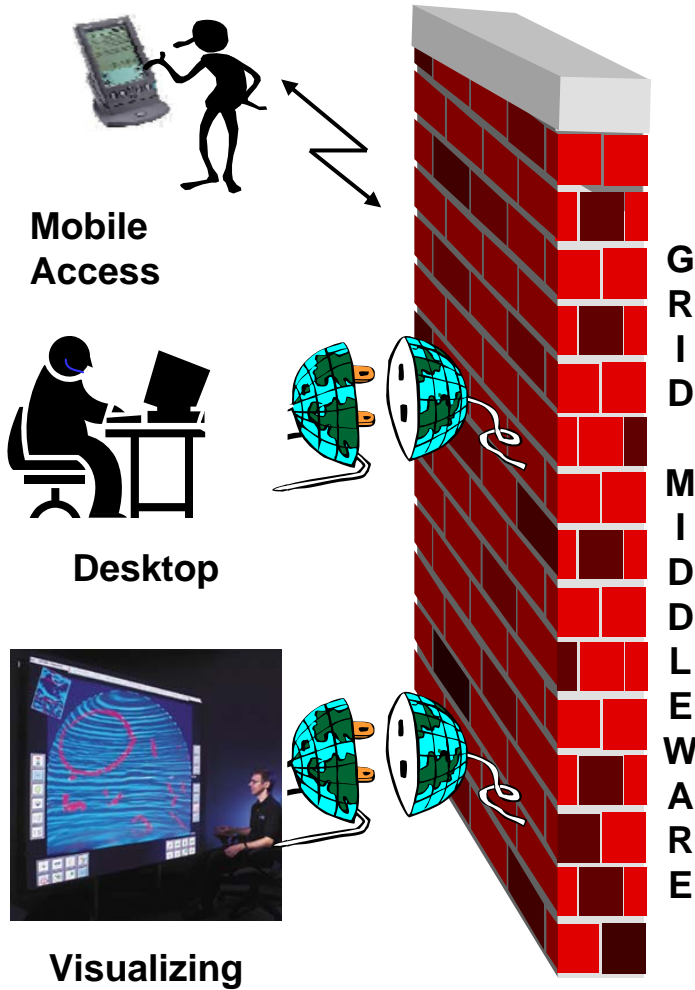
*European ILC Software and Physics Meeting  
Cambridge, UK, 04.04.2006*



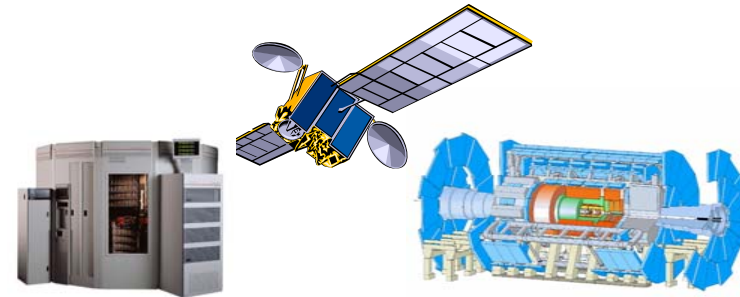
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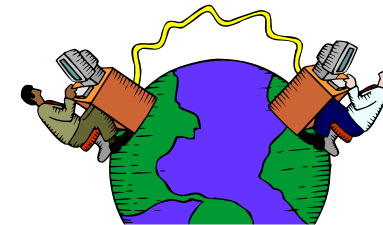
# The Grid Dream



Supercomputer, PC-Cluster



Data Storage, Sensors, Experiments



Internet, Networks



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# Grid Computing

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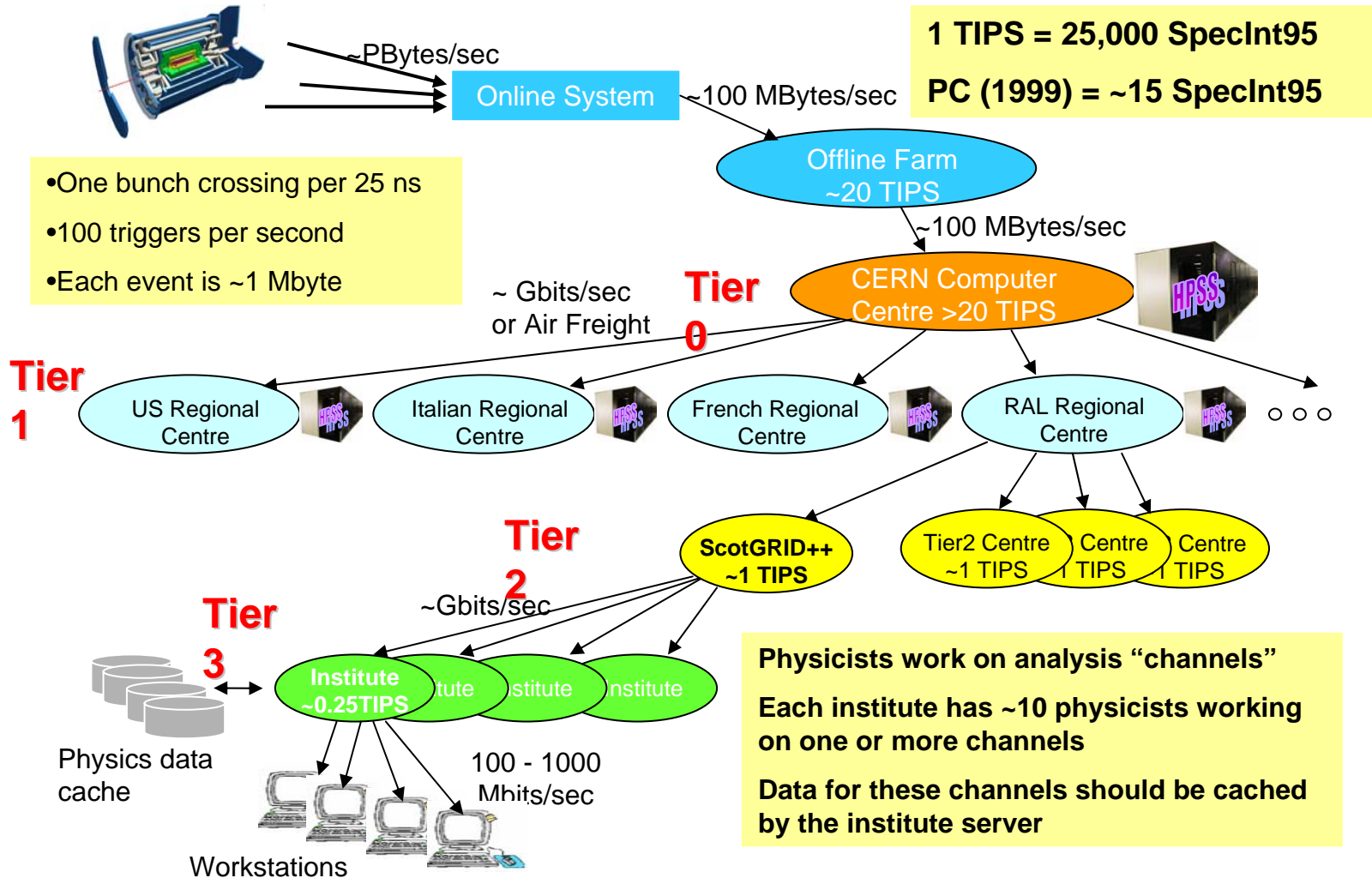
- Grid Computing is about *virtualization* of resources
- The Grid is there – pioneered by **LCG**
- (Almost ) all HEP **resources** have been moved to the Grid
- Grid **tools** become the *de facto* standard for computing (local batch system globally accessible ) and data access (GridFTP, SRM, Catalog Services)
- User management done within *Virtual Organizations* (VO)
- Certificates for authentication rather local site account
- Embedded in the EU project **Enabling Grids for E-sciencE** (EGEE)



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# The LHC Computing Model





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# Building Blocks



- A *Virtual Organization (VO)* is a dynamic collection of individuals, institutions, and resources which is defined by certain sharing rules.
  - A VO represents a collaboration
  - Users are members of a certain VO (*Authorization*)
  - Users authenticate themselves with a certificate (*Authentication*)
  - Certificates are issued by a national *Certification Authority (CA)*
- Grid Infrastructure
  - Core Services (mandatory per VO)
    - VO Membership Services
    - Grid Information Services
    - Resources Brokers
  - Resources (brought in by partners) (*Grid sites*)





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# Grid @ DESY ...

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- Grid activities were initially driven by the demand for resources for MC production of the HERA experiments H1 and ZEUS
- The International Lattice Data Grid (ILDG) and the International Linear Collider Community (ILC) joined the Grid activities
- DESY participates in EGEE (since 2004) and D-GRID (since 2005)
- DESY sets up LCG Tier-2 centers for ATLAS (in federation w/ U Freiburg) and CMS (in federation w/ RWTH Aachen)
- DESY participated in the Service Challenges SC3 and prepares for SC4 and the Pre-Production Service PPS for LHC
- DESY operates a complete Grid infrastructure incl. all services



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- Quattor (SL 3.05 for all nodes; complete installation for WNs)
- LCG-2\_6\_0 / LCG-2\_7\_0, Yaim (for all service nodes)
  
- Central **VO** Services: (*unique per VO*)
  - **VO** (LDAP) [grid-vo.desy.de]
  - **VOMS** [grid-voms.desy.de]
  - Catalogue Services: RLS / **LFC** [grid-cat2.desy.de]
  
- Distributed **VO** Services: (*mandatory per VO*)
  - Resource Broker (**RB**) [grid-rb.desy.de]
  - Information Index (**BDII**) [grid-bdii.desy.de]
  - Proxy (**PXY**) [grid-pxy.desy.de]



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# ... Grid @ DESY

- Site Resources:
  - **GIIS:** DESY-HH [grid-giis.desy.de]
  - **CE:** 83 \* XEON/2.8-3.06 GHz [grid-ce0.desy.de]
  - **CE:** 166 \* Opteron/2.4 GHz [t2-ce0.desy.de]
  - **CE:** 34 \* XEON/1GHz (ZEUS) [zeus-ce.desy.de]
  - **SE:** dCache-based w/ access to DESY data space of 0.5TB
- Grid (Tier-2) Resource Planning:
  - 2005: 200 kSpecINT2k 30 TB
  - **Now:** 350 kSpecINT2k 75 TB
  - 2006: 800 kSpecINT2k 200 TB
  - 2007: 1400 kSpecINT2k 600 TB
  - 2008: 1600 kSpecINT2k 600 TB
  - 2009: 1800 kSpecINT2k 800 TB





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# VO Support @ DESY

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- VOs hosted at DESY:
  - Global: *'hone'*, *'ilc'*, *'zeus'* (registration via LCG registrar system)
  - Regional: *'calice'*, *'dcms'*, *'ildg'*
  - Local: *'baikal'*, *'desy'*, *'herab'*, *'hermes'*, *'icecube'*
- VOs supported at DESY: (Tier-2)
  - Global: *'atlas'*, *'cms'*, *'dteam'*
  - Regional: *'dech'*
- H1 Experiment at HERA (*'hone'*)
  - desy, uni-dortmund, cscs, gridpp, bham, ucl, lancs, ox, marseille, cyf-kr, saske
- ILC Community (*'ilc'*, *'calice'*)
- ZEUS Experiment at HERA (*'zeus'*)
  - desy, uni-dortmund, gridpp, bham, ucl, lancs, ox, marseille, cyf-kr, saske, infn, utoronto, uam, scotgrid, weizmann, scai, bris, tau, ed



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# ILC @ Grid

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- The VOs 'ilc' and 'calice' are hosted at DESY w/ all core services
- *Registration* to 'ilc' is managed by LCG (<http://lcg-registrar.cern.ch>) and has become a so-called *global* VO in EGEE
- 'ilc' is currently supported by ~10 UKI sites, LAL, Freiburg, DESY (27 CEs, 3500 CPUs, 42 TB, 6 RBs)
- Data have been moved to SLAC with Grid tools
- 'calice' is supported by DESY and Imperial College (IC)
- The testbeam data of CALICE were moved between DESY and IC using Grid tools (GridFTP, SRM, LFC)



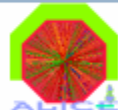
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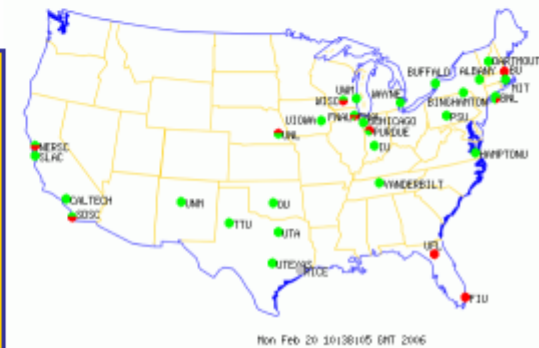
# GOC Grid Monitoring



Grid Projects Collaborating in LHC Computing Grid

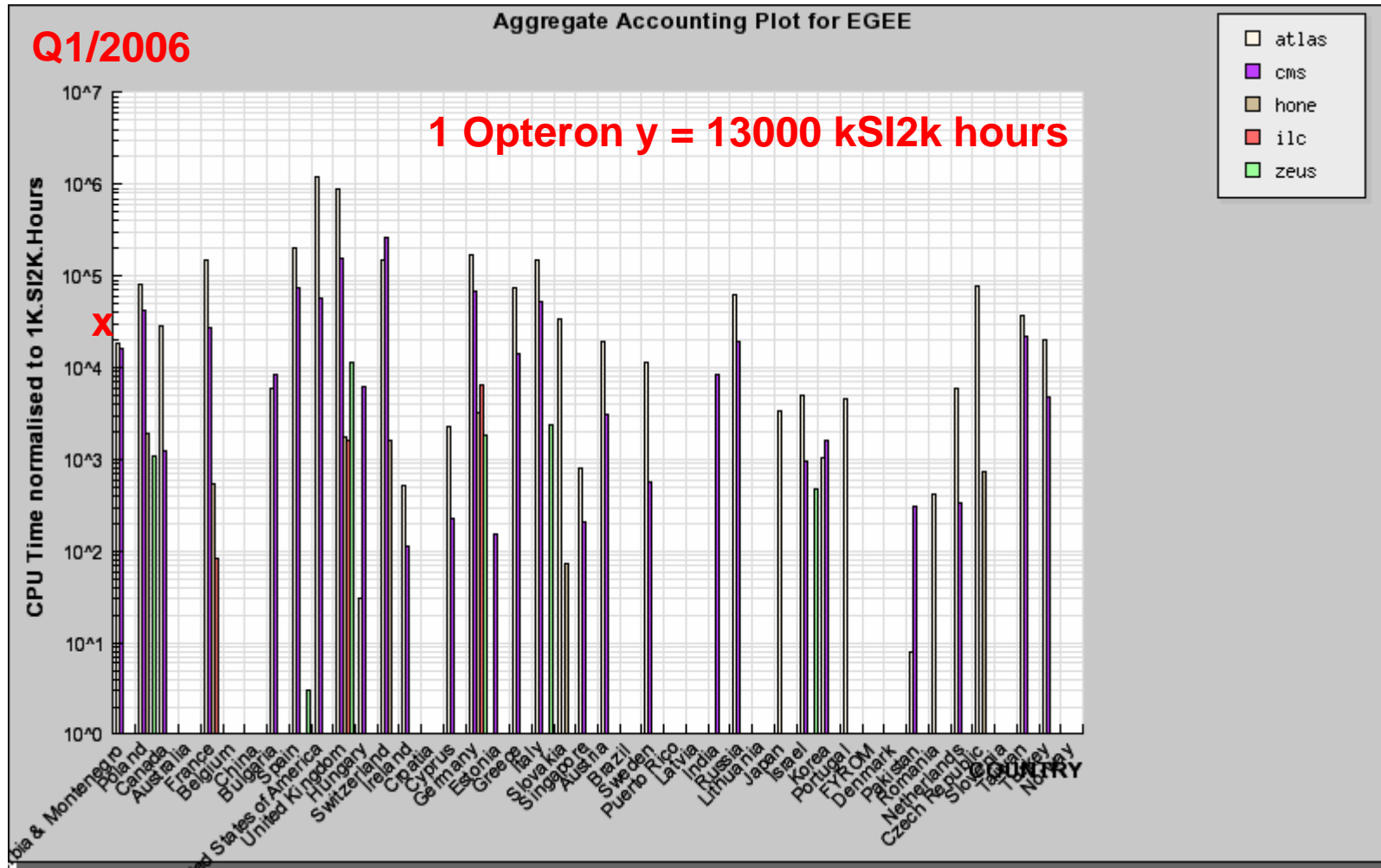


EGEE Operations Information	
Active Sites	188
Available CPU	35676
Available Storage (TB)	3411
2006-03-31	



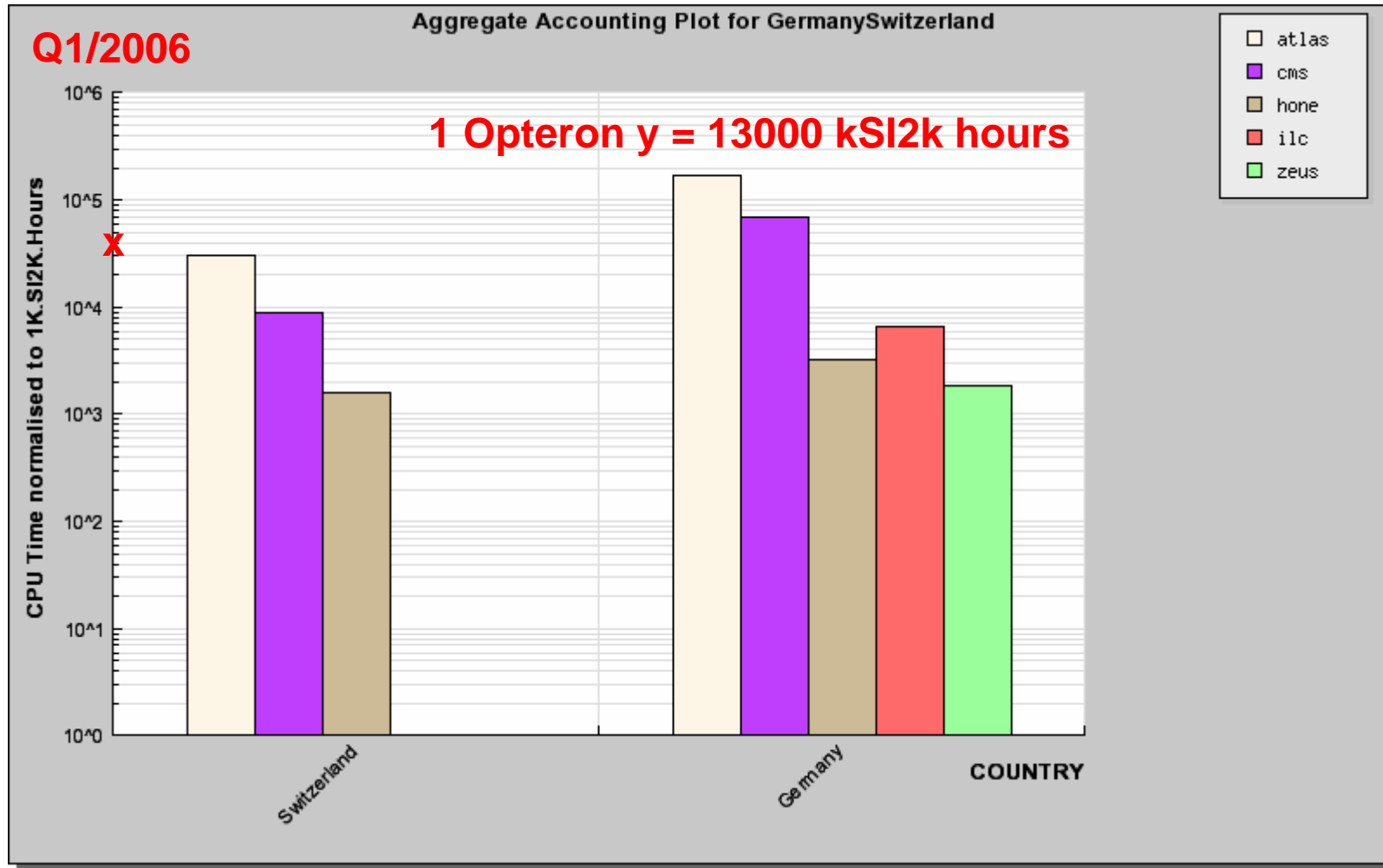


# EGEE Accounting ...



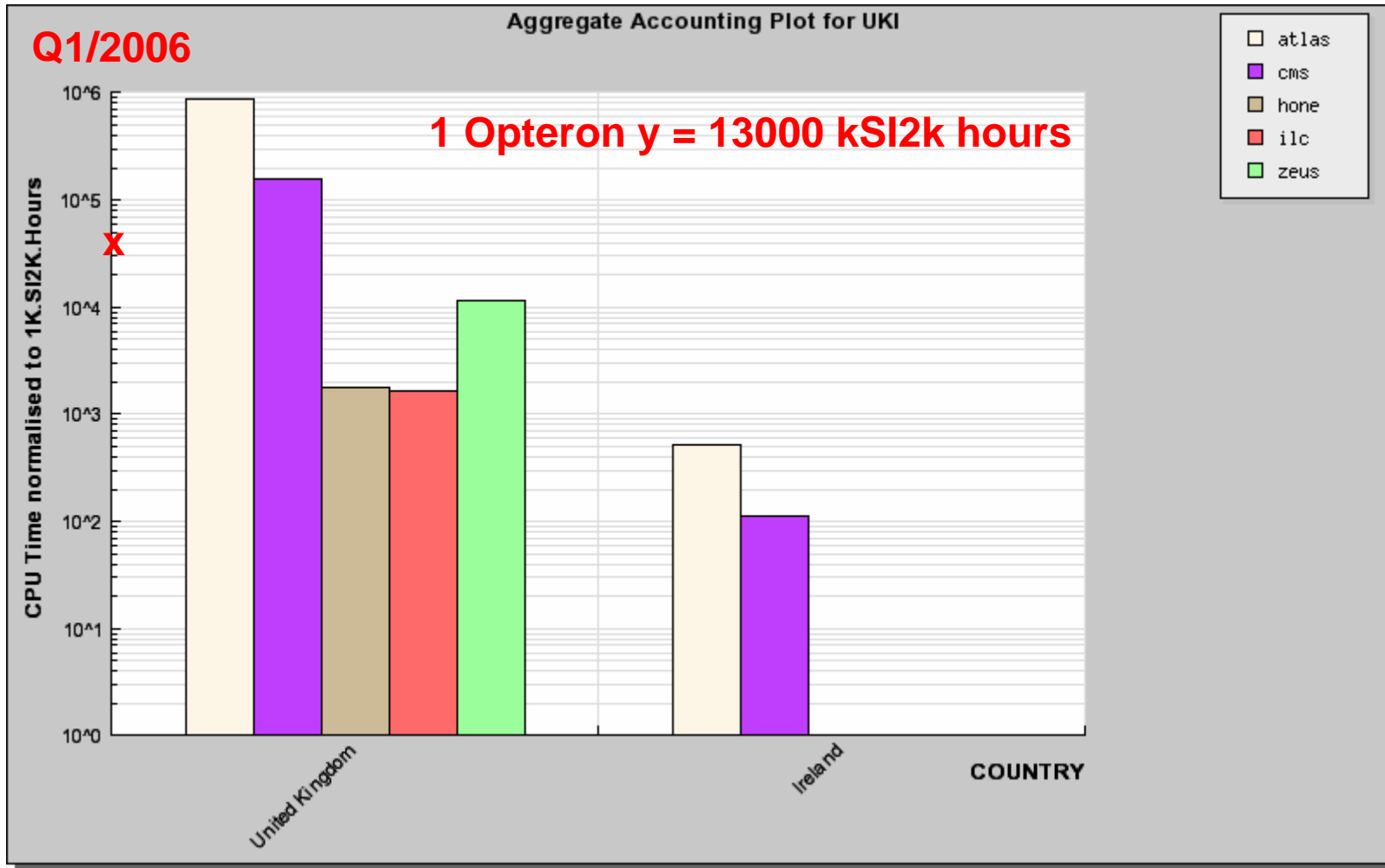


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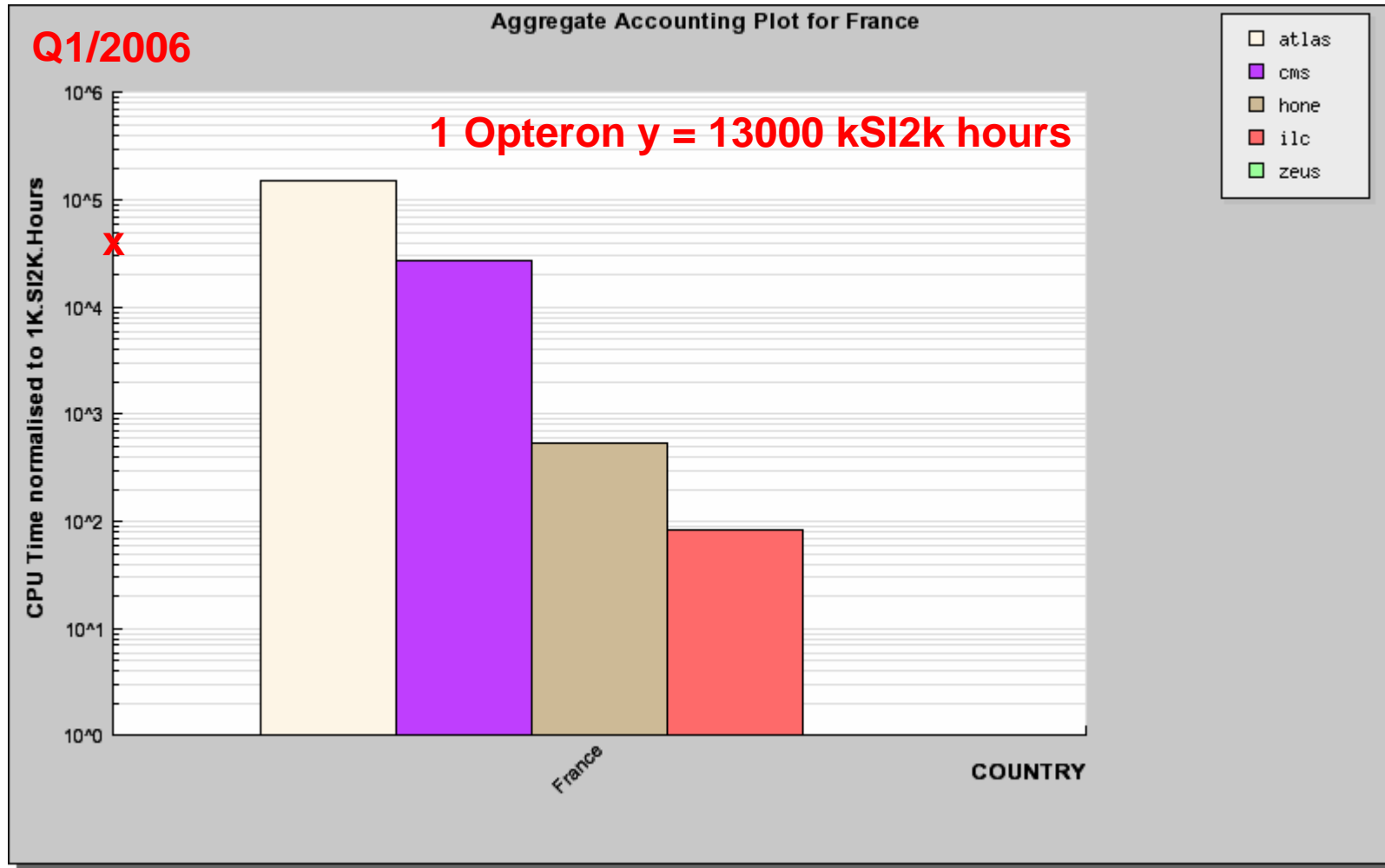


# ... EGEE Accounting ...





# ... EGEE Accounting





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# Future Aspects

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- The Grid infrastructure will move to gLite middleware
  - Client commands might slightly change
- Scientific Linux 4 is coming (pushed by the LHC experiments)
  - Software must run on SL4 WNs
- Multiple VO membership has been a hot topic
  - VOMS is being rolled-out
- Database access by many concurrent jobs
  - Caching technologies are under development
- Continue to use resources parasitically?





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# Conclusions

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- Grid Computing is a **strategic** technology for the future
- (Significant) **resources** will be available in the Grid (only)
- The Grid requires **global** thinking
- DESY maintains a Grid Infrastructure *in production*
- DESY is an LCG **Tier-2** centre for **ATLAS** and **CMS**
- **H1**, **ILC**, and **ZEUS** heavily use the Grid for **MC** production
- Service Challenges **SC3/SC4**
- *VOs already exist* for **ILC** and **CALICE** with international support



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# At Last

The Grid is ready for ILC!



Get your certificate quick  
and  
start to use the Grid!



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# Grid @ Web

- DESY Grid Web Sites:

- ✓ <http://grid.desy.de/>

- ✓ <http://grid.desy.de/certs/>

- ✓ <http://grid.desy.de/users/>

- ✓ <http://grid.desy.de/install/DESY-VO.html>

- Grid Computing Web Sites:

- <http://cic.in2p3.fr/>

- <http://cern.ch/lcg/>

- <http://www.eu-egee.org/>





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# Grid Infrastructure

