



Grid Computing: Current and Future Developments



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Introduction ...

- ILC is on the Grid ...
 - ... now it is time to polish things ...
 - ... and add some more understanding.
- [ILC includes the VOs '**calice**' and '**ilc**']
- Today:
 - Introduction
 - Authorization (multiple VO membership, VOMS)
 - Data access (global, local)
 - VO support
 - Open issues
 - Practical advises
 - Some numbers



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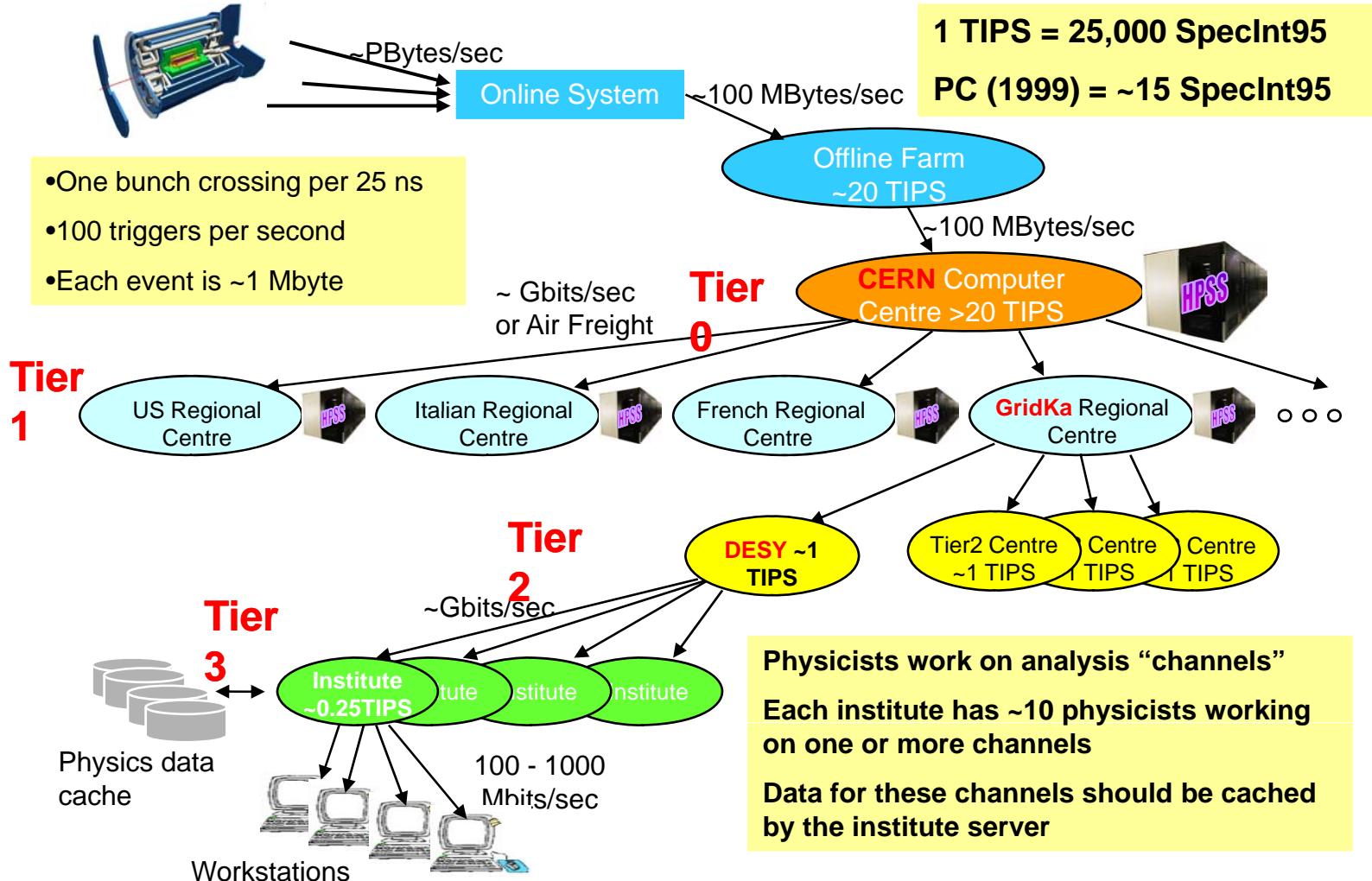
... Introduction

- ILC is supported by a lot of sites world-wide, mainly Tier-2 sites
- Grid infrastructure is used parasitically, e.g. LCG
- DESY *hosts* the VOs '*calice*' and '*ilc*' in its Grid infrastructure which is also used for the HERA experiments as a Tier-2

- A strong commitment to ILC exists
- Sites dedicate resource *shares* to ILC

- Supporting sites are:
 - desy, ifh, freiburg
 - France (lal, lyon, ecole polytechnique (LLR), saclay)
 - fnal
 - ral, brunel, ic, cam, ox, bham, ucl, manchester, ed, lesc, qmul, rhul, gla
 - tau
 - kok

The LHC Computing Model





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Authorization ...

- *Authentication* is done by way of individual user certificates which are issued by *Certification Authority* (CA)
- *Authorization* is done in the context of a *Virtual Organization* (VO)
- DESY operates *Virtual Organization Membership Service* (VOMS) for the 2 VOs: '**calice**' and '**ilc**'
- Users can be members of more than one VO, e.g. '**atlas**' and '**ilc**'
- Registration (Grid user cert is needed!):
 - <https://grid-voms.desy.de:8443/voms/calice>
 - <https://grid-voms.desy.de:8443/voms/ilc>



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... Authorization

- VOMS-proxies contain extension w/ VO membership:
> voms-proxy-init -debug -voms ilc:/ilc
- The CEs are ready for VOMS proxies
- Mapping is done the appropriate queues
- dCache SEs will be aware of VOMS proxies soon
- Open issue:
 - Make '*calice*' a group of '*ilc*' to have only one
> voms-proxy-init -debug -voms ilc:/ilc/calice
- There are wishes to use VOMRS for users registration ...



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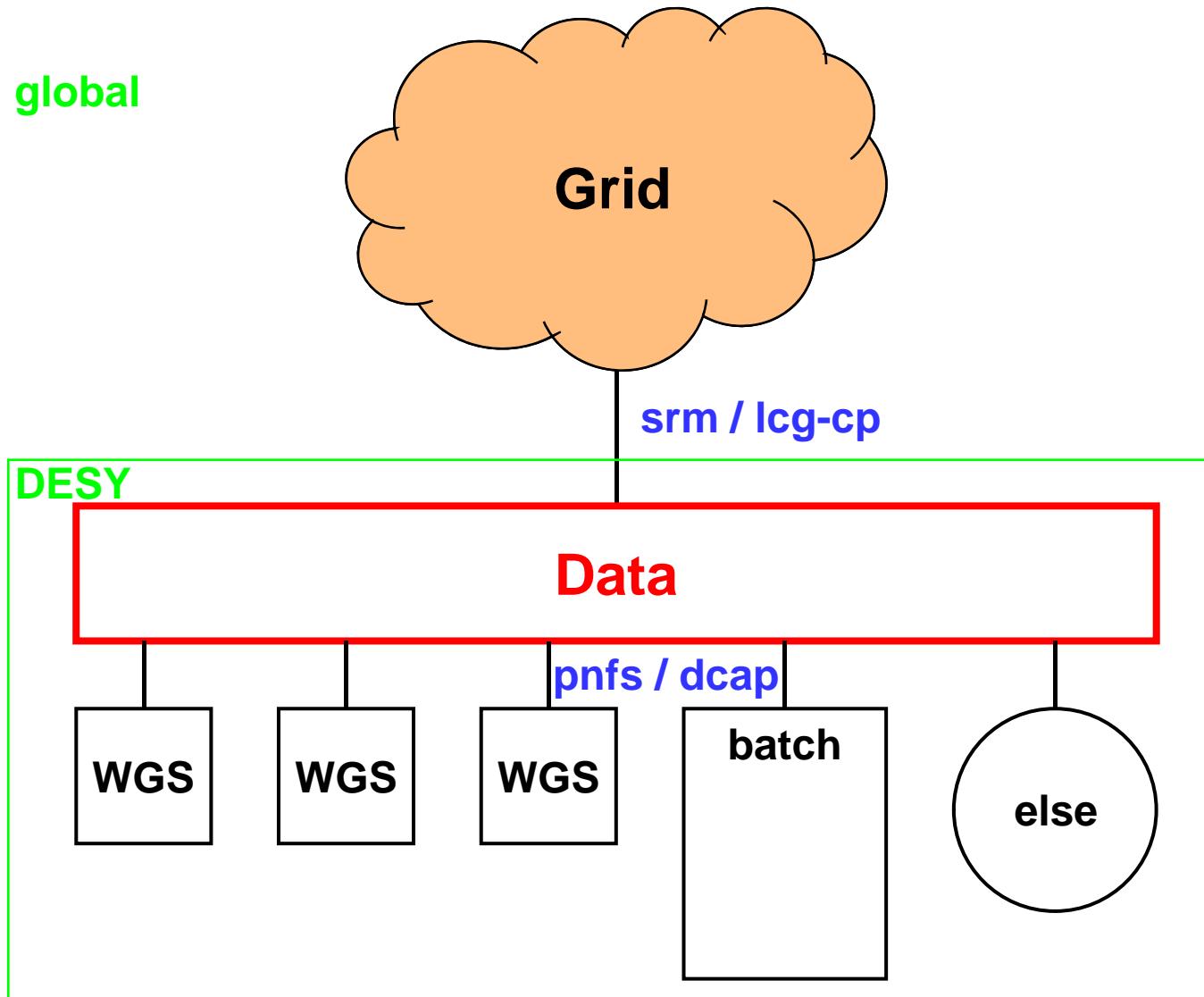
Data Access ...

- The *computing* part (providing and using CPU cycles for jobs) is the easy part of the Grid.
Jobs are *volatile*.
They come and go - even when they crash – and might go to another site instead.
There is almost no integrity problem.
- The Grid's main challenge is the *storage* of data.
Data are *persistent* and *referenced*.
They remain in the storage system and are known to the file catalogue upon deletion (the latter even when the storage system fails). There is an integrity problem!



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... Data Access ...





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... Data Access

- DESY supports a repository for ILC data
- DESY maintains a tape back-end to which data files can be automatically copied
- The main *Storage Element (SE)* is ‘`srm-dcache.desy.de`’
- However, dealing with large data sets is not trivial!
The default directory path which is selected when copy-and registering files is disk-only, though safe
- Contact us to arrange for more ...



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VO Support ...

- EGEE provides the *Global Grid User Support (GGUS)* portal for all global EGEE VOs, e.g. 'ilc':
 - <https://gus.fzk.de/>
 - An sophisticated support structure exists
 - ROC-on-duty service
 - Problems are routed to the affected sites
 - Might take some time
- In addition, mailing lists (ML) are hosted by DESY:
 - calice-vo-support@desy.de
 - calice-vo-users@desy.de
 - ilc-vo-support@desy.de
 - ilc-vo-users@desy.de



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... VO Support

- Do we need more?
 - Coordinated development of scripts and tools?
 - Designated support on user level?
 - Central MC production?
- Some announcements and discussions hit the VO users ML
- We think about asking people by way of a questionnaire what they miss?
- Is this needed? What do you think?
- In any case, report problems!



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Open Issues

- Stability of the middleware components / services
- Performance of the job submission; turn-around times

- The Grid is about to move to SL4 (though SL5 is out already) ...
- ... but not yet done
- SL3 support will stop this year ...

- As we learned, usually SL3 executables run on SL4 WNs

- Be aware!



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Practical Advises

- Find out about resources via:
 - > lcg-infosites -vo ilc all
 - > lcg-infosites -vo ilc rb
 - > lcg-infosites -vo ilc ce
 - > lcg-infosites -vo ilc se
 - > lcg-infosites -vo ilc lfc
- We maintain dedicated *Resource Brokers* (RB) via aliases:
 - ilc-rb.desy.de
 - calice-rb.desy.de
- The catalogue is:
 - grid-lfc.desy.de

Appendix: Grid Services @ DESY

- Quattor (SL 3.08 for all nodes; complete installation for WNs)
- GLITE-3_0, Yaim (for all service nodes)
- Central VO Services: (*unique per VO*)
 - VO Members (VOMS) [grid-voms.desy.de]
 - Catalogue Services (LFC) [grid-lfc.desy.de]
- Distributed VO Services: (*mandatory per VO*)
 - Resource Broker (RB) [ilc-rb.desy.de]
 - Workload Management (WMS) [grid-wms.desy.de]
 - Information Index (BDII) [grid-bdii.desy.de]
 - MyProxy (PXY) [grid-pxy.desy.de]

Appendix: Grid Resources @ DESY

- Site Resources:
 - GIIS: DESY-HH [grid-giis.desy.de]
 - CE: 166*Opteron/2.4GHz [grid-ce0.desy.de]
 - CE: 324*Opteron/2.2 Woodcrest/3.0GHz [grid-ce1.desy.de]
 - CE: 90*Xeon/3.0GHz [grid-ce2.desy.de]
 - SE: dCache-based w/ access to DESY data space incl. tape
- Grid (Tier-2) Resource Planning
 - Now: 850 kSpecINT2k (200) TB
 - 2008: 1600 kSpecINT2k 600 TB
 - 2009: 1800 kSpecINT2k 800 TB

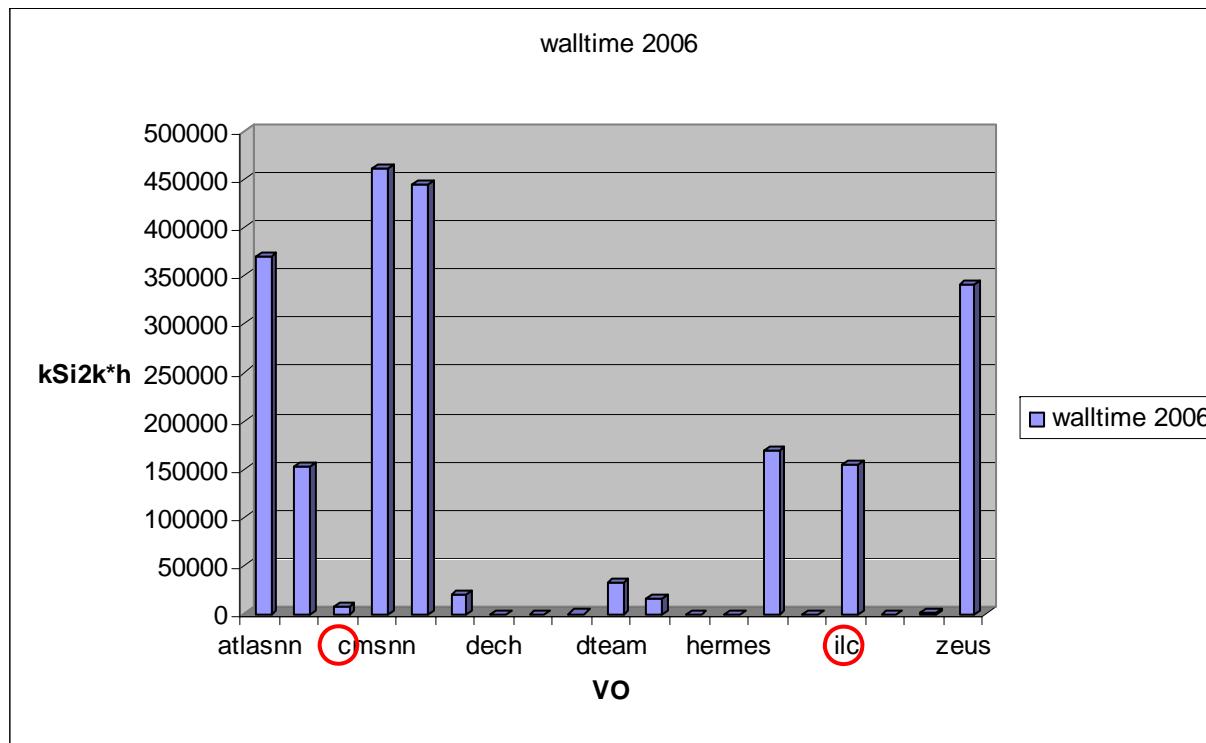


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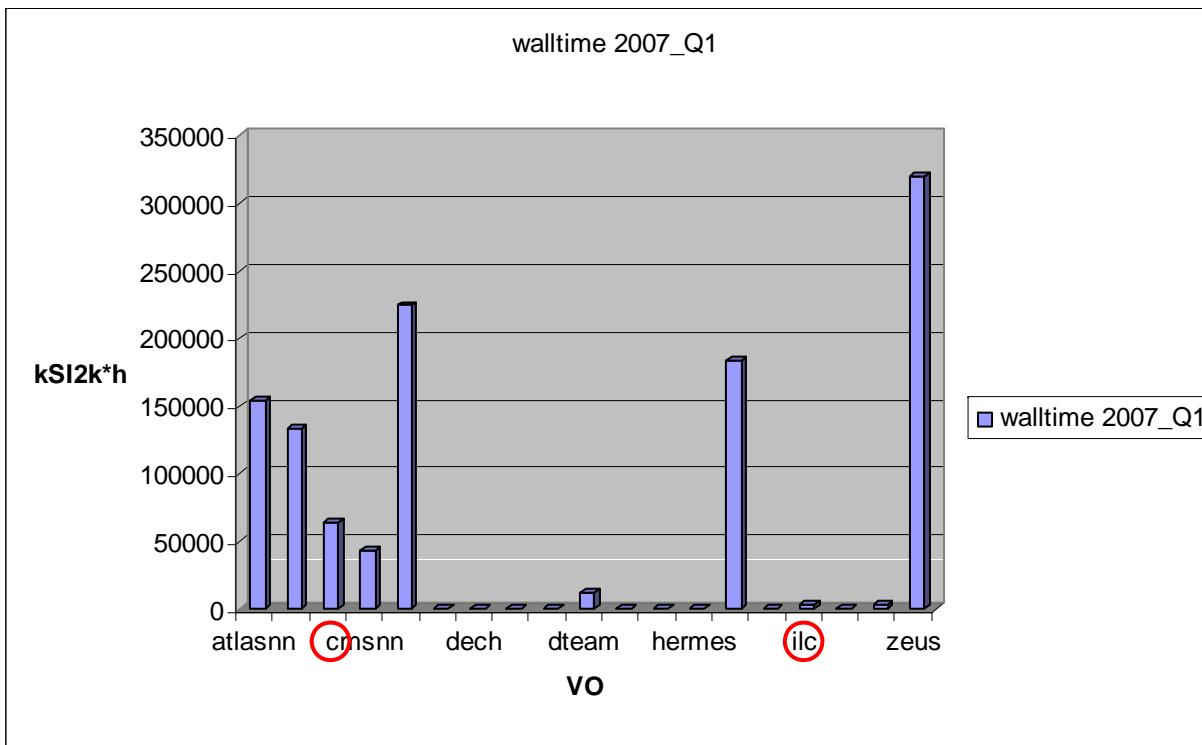
Appendix: VOs @ DESY

- VOs hosted at DESY:
 - Global: '*hone*', '*ilc*', '*zeus*'
 - Regional: '*calice*', '*ildg*'
 - Local: '*baikal*', '*desy*', '*herab*', '*hermes*', '*icecube*'
- VOs supported at DESY:
 - Global: '*atlas*', '*cms*', '*dteam*'
 - Regional: '*dech*'
- H1 Experiment at HERA ('*hone*') (<http://grid-voms.desy.de:8443/vomses/>)
- ILC Community ('*ilc*', '*calice*') (<http://grid-voms.desy.de:8443/vomses/>)
- ZEUS Experiment at HERA ('*zeus*') (<http://grid-voms.desy.de:8443/vomses/>)

Appendix: Usage @ DESY ...



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Appendix: ... Usage @ DESY

- Storage:
 - ‘calice’:
 - Disk Grid: 41 GB
 - Tape:
 - tb-cern: 9.7 TB
 - tb-desy: 4.2 TB
 - ‘ilc’:
 - Disk Grid: 1.2 TB
 - Tape: 94 GB



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Conclusions

- 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 generic 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
- Note: Non-HEP Grid applications gain significance

Appendix: The Grid on the Web

- The Grid on the web at DESY:
✓ <http://grid.desy.de/>
- German Grid Initiative:
 - <https://www.d-grid.de/>
- LCG and EGEE:
 - <http://cern.ch/lcg/>
 - <http://www.eu-egee.org/>
 - <http://cic.in2p3.fr/>