Belle II @ DESY Grid

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DESY

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> Multi-VO site

- **WLCG** Tier-2: ‘atlas’, ‘cms’, ‘lhcb’
- **Regional Data Center**: ‘belle’ (2021: Raw Data Center)
- Other: ‘ilc’

> CPU

- **Federated** CPU resources in *HTcondor* batch farm behind 3 ARC-CEs
- Total: 416 hosts w/ 18272 cores == 210kHS06
- CentOS7 (EL7) on all batch nodes
- SL6 w/ singularity exclusively for ‘belle’
- **Memory**: 4GB/job / **Scratch**: 20GB/job
- **Opportunistic** usage beyond fixed shares

> Storage

- Separate *dcache*-SEs for VOs
- SRM, xrootd, gridftp, http/webdav
- IPv4 & IPv6

*grid-arcce2.desy.de:2811/nordugrid-Condor-gridsl6*
DESY: **Belle II**

> **Belle II Computing @ DESY:**

- Belle II Collaborative Services (B2CS)
- **Grid Site** (DESY-HH)
- Analysis Facility (NAF)

> **Achieved 2019:**

- MoU signed
- Pledges fulfilled by April 1\(^{st}\) (WLCG and Belle II)
- Policy: Pledges in warranty on due day April 1\(^{st}\)
- Pure EL7 Grid batch farm (HTcondor)
- Old opportunistic SL6 nodes retired
- Full IPv6 in addition to IPv4

> **Planning for 2020:**

- (Almost) no changes in in WLCG and Belle II pledges
- Exchange of old hardware (CPU and storage)
DESY: Belle II Resources (Nov 2018 – Oct 2019)

> Pledges:

- Germany: 47% DESY, 47% KIT, 6%MPP
- Due day: April 1\(^{st}\), 2019

> CPU pledges

- DESY 2019: 16.85 kHS06 == 1458 slots
- HTcondor quota: 30% == 5481 slots == 63 kHS06
- EGI portal: 43 MHS06h / (Nov 2018 – Oct 2019) == 5 kHS06
- Belle II @ DESY-HH: 1.7%
- DESY-HH @ EGI: 8.7% of all Belle II computing

> Storage pledges

- 1 PB = 10\(^{15}\) B(yte) (base: 1000)
- DESY 2019: 0.63 PB
- Belle II exclusive – no NAF, no Belle (I)
- No SRM space tokens
- Accounting: occupancy.json

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 checkBox cherish
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> CPU

![Cores (all) running per VO](image)

- **atlas**: R=18046
- **lhcb**: atlas=7845
- **belle**: belle=73
- **desy**: cms=9066
- **ops**: desy=0
- **ilc**: ilc=62
- **lhcb**: lhcb=999

DESY-HH
> Storage
DESY: Wide Area Network

- DESY used to separate LHCom and non-WLCG-WAN (X-WIN) with rather low bandwidths.
- In 2019 WAN connections were consolidated by using a common line with higher bandwidth.
- Now: 2 x 50 Gbit/s combined LHCom and X-WIN.
- Monitoring split by source/destination → adding up.

Line 1

Line 2
DESY: Analysis Facility (NAF)

- Interactive complement to the batch-like Grid
- Open to Belle II (see confluence how to prepare account)
- *Htcondor*-based
- ~10k cores == ~100 kHS06
- Independent *GPFS*-based scratch storage space (DUST) of 1 TB/user
- *dcache*-based mass storage space (PNFS) of 130 GB via NFS4.1
- Separate space, NOT accounted in Belle II SE

- Copying data on request of Physics Working Groups (coordinator: Torben Ferber)
- Very clumsy for small (mdst) files!
- KEK-SE ↔ DESY-SE: 80 MB/sec for O(10 GB) files reachable
DESY: Concluding Remarks

> CPU

- Average usage is ~1/3 of pledges (5 kHS06 vs. 16.85 kHS06)
- Opportunistic usage model at DESY-HH

> 2019 pledges

- approved by BPAC in Nov 2018
- due day April 1st, 2019
- massive change of the luminosity profile in Jan 2019 not taken into account
- never change crucial numbers (pledges) retrospectively to remain reliable …
- basically we are already done for the 2020 pledges

> Data-centric HEP world

- Data are most crucial since HEP is data centric
- WLCG experiences show that the Grid alone is not enough for user analysis
- Strategies are needed to distribute data for analysis as fast and efficiently as possible