



Belle II @ DESY Grid

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DESY

34th B2GM
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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

```
grid-arcce2.desy.de:2811/nordugrid-Condor-grids16
```

> Storage

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



> Belle II Computing @ DESY:

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

> Achieved 2019:

- MoU signed
- Pledges fulfilled by April 1st (WLCG and Belle II)
- Policy: Pledges in warranty on due day April 1st
- 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 1st, 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

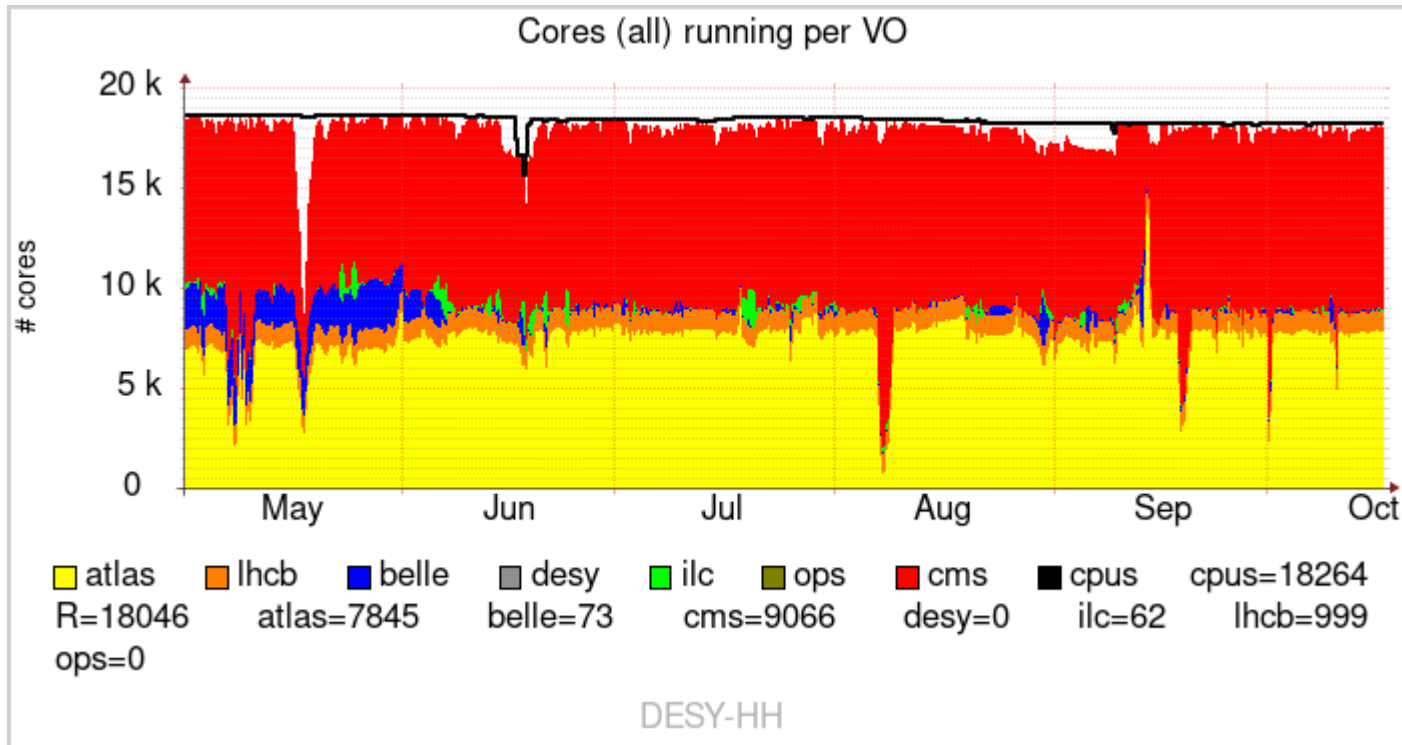
> Storage pledges

- 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`

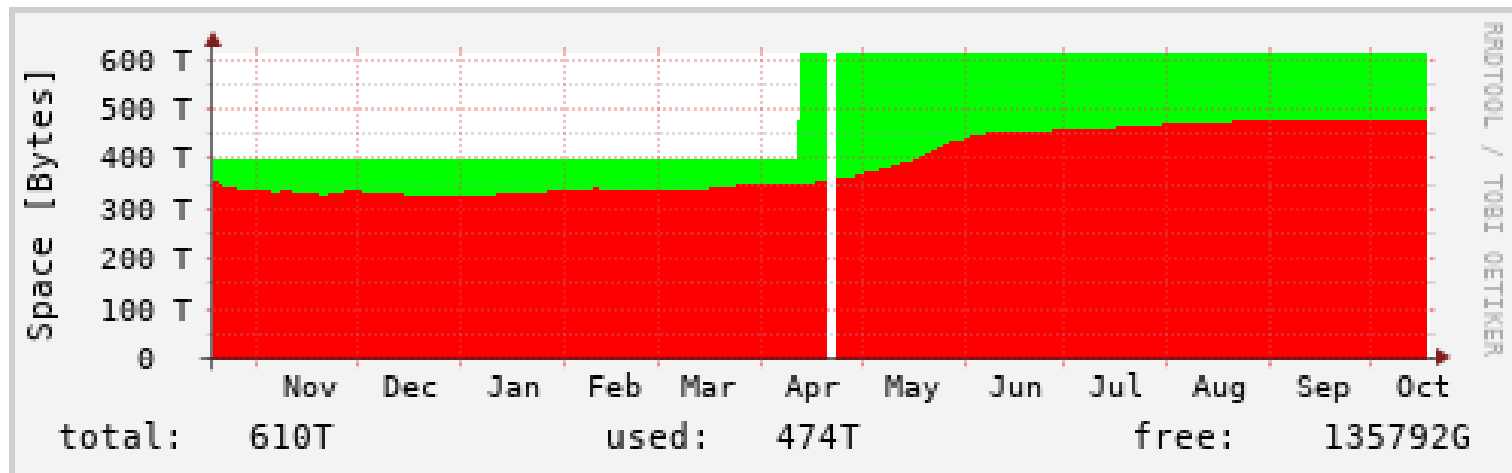
```
/pnfs/desy.de/belle/belle2/TMP/belle/occupancy.json
{
  "Time:": 1571324971,
  "Total": 609868541081512,
  "Used": 386562826738010,
  "Free": 136822662943598
}
```



> CPU



> Storage



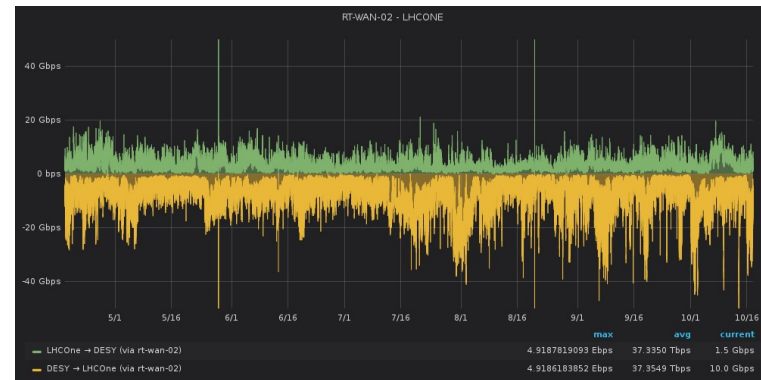
DESY: Wide Area Network

- DESY used to separate LHCone 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 LHCone 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

