OPERATION OF THE ATLAS DISTRIBUTED COMPUTING

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System Overview[1]

- \> 370 PB data (1.5 PB every week)
- \> 180 sites in 40 countries
- GRID, HPCs, Clouds, Volunteers[2]
- 12 GB/s global throughput
- 360k simultaneously running slots (up to 960k)
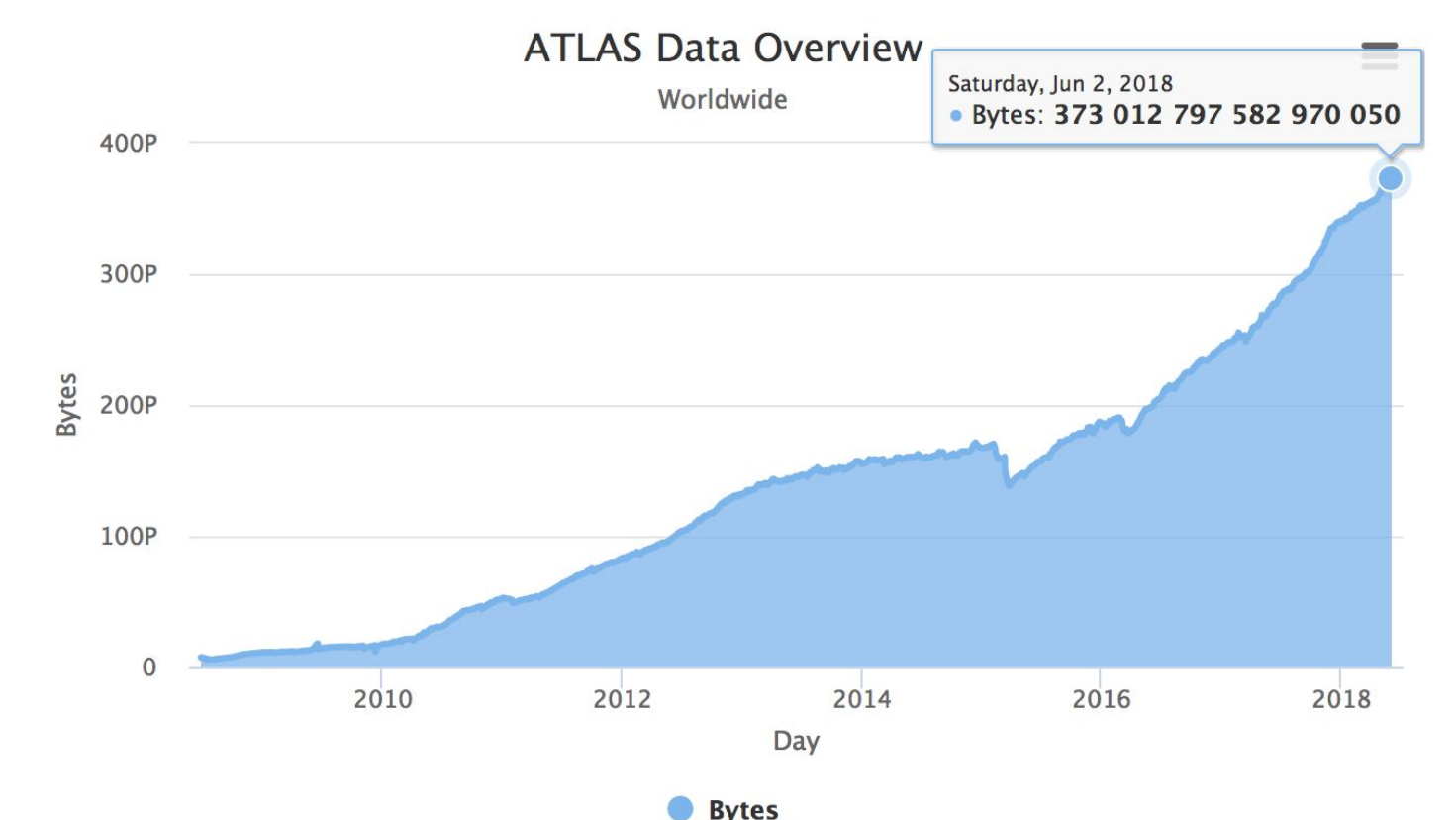 - \> 1.1M completed jobs per day (up to 2.7 M)
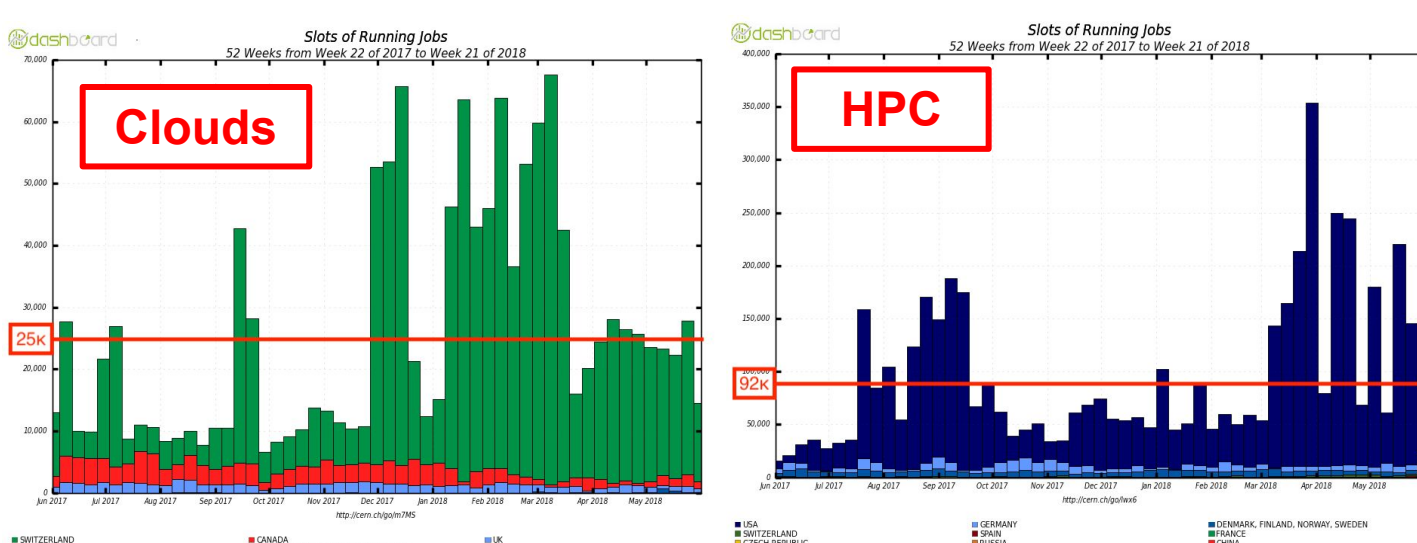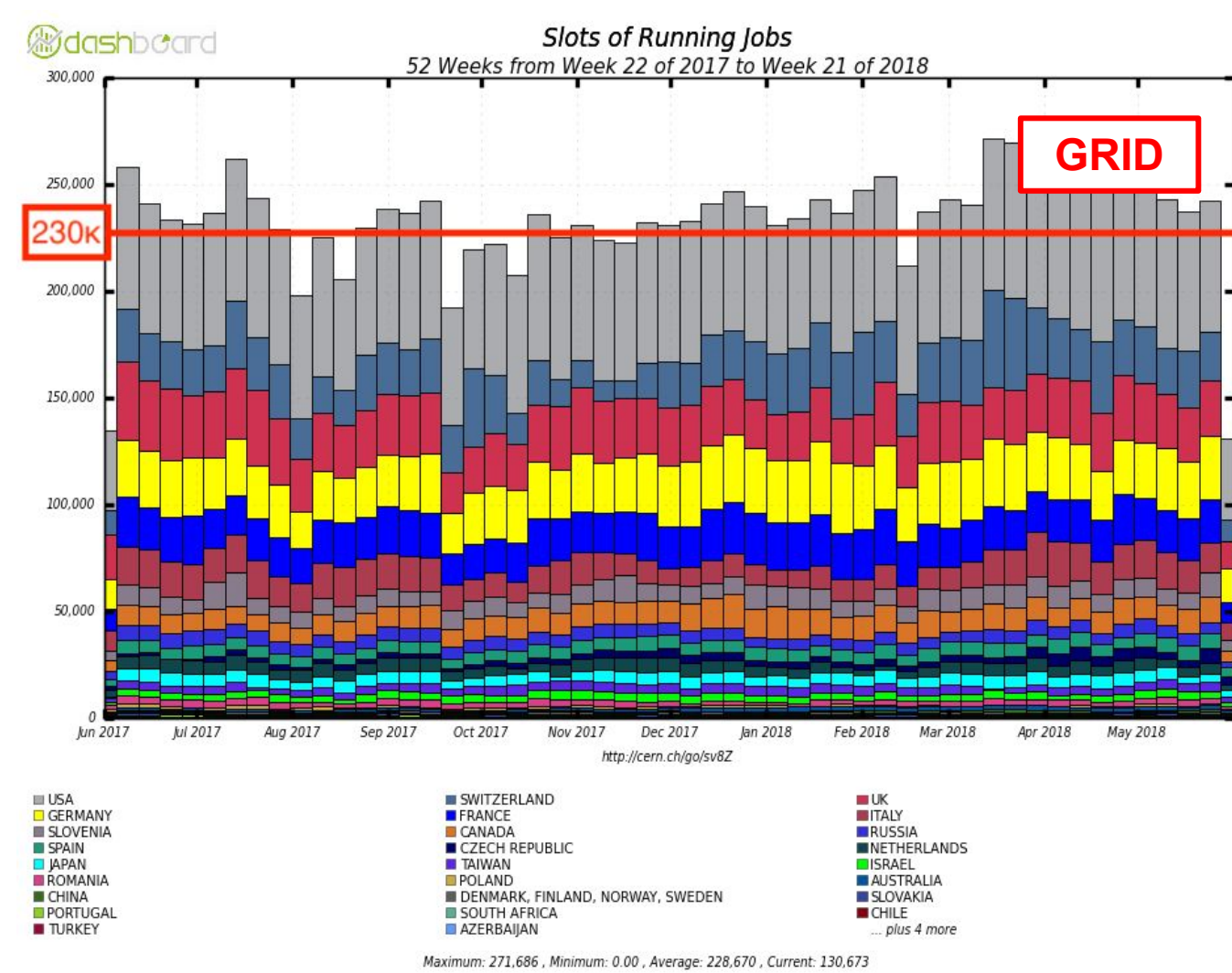

Fig.1 Amount of ATLAS data by 02.06.2018

Operations

- Manage expectations (workflow priorities) - Global shares[3]
- Interaction with stakeholders (sites, analysis users, production managers)
- Accounting, monitoring and alarming
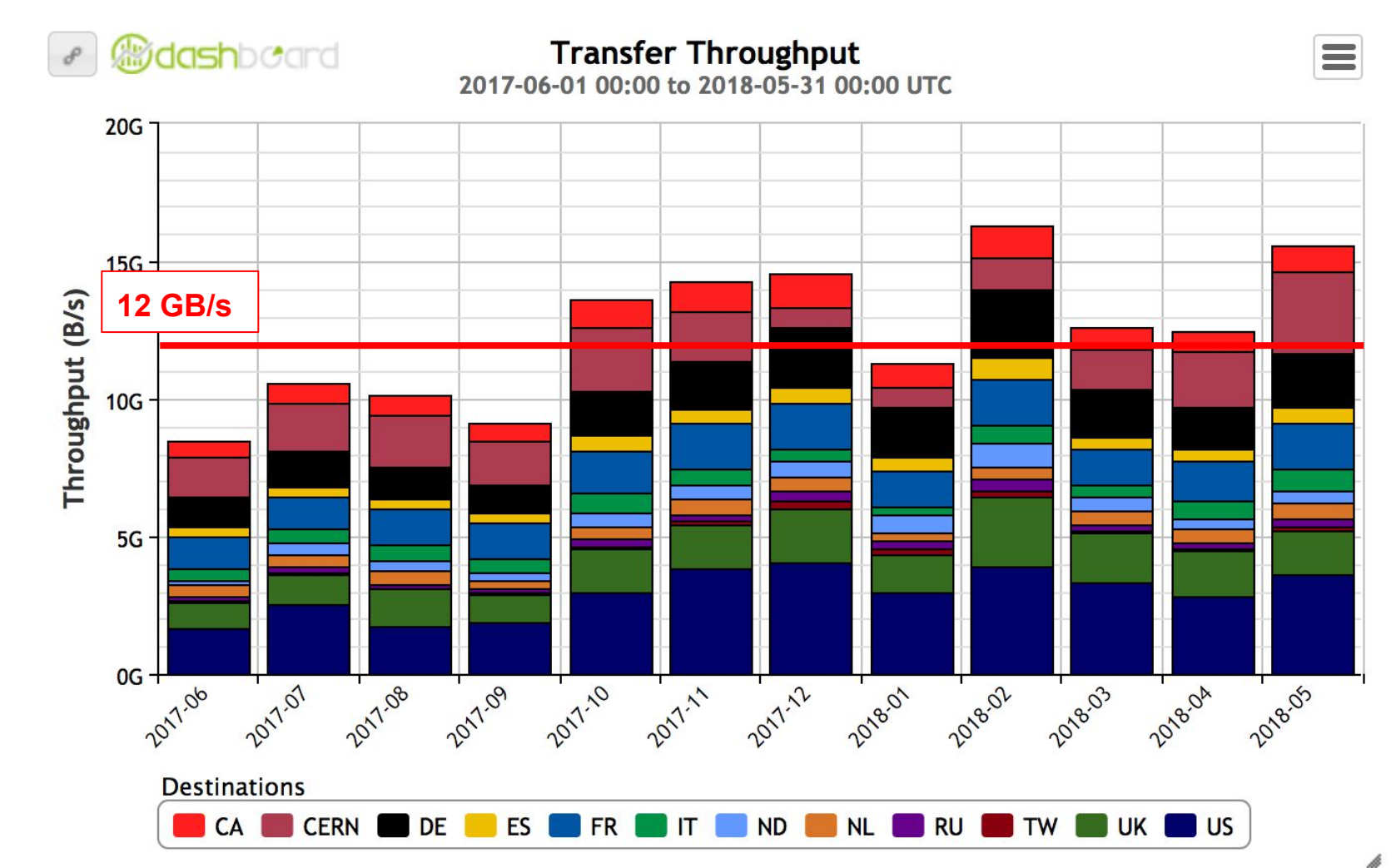- System development and deployment

Fig.2 Running job slots contribution per resource type - GRID, HPCs, Clouds

Fig.4 Average ATLAS data throughput in the last year

Optimizations driven by Operations

- Failure rate minimization
- Network utilization
- Disk and tape storage utilization
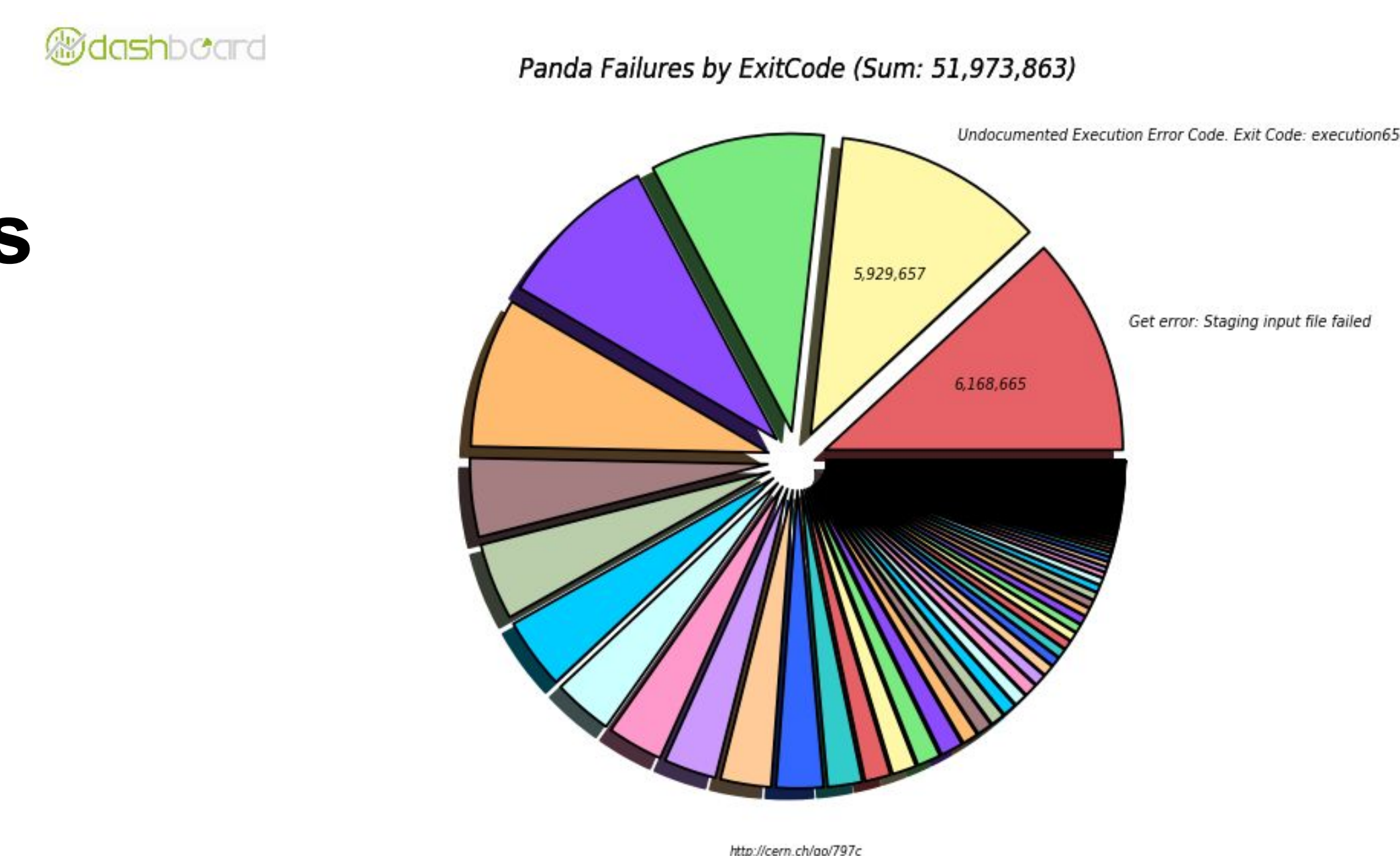- Local batch resource utilization

Fig.3 Number of completed jobs per day grouped by Tier

Fig.5 ATLAS Computing failures by category

Optimizations: I/O Intensity

- I/O intensity is defined as the input datasize normalized to the job walltime
- It is heavily used in combination with the input data location and data size to be moved in the job brokerage.
- A central limit on both input data size to be moved and I/O intensity is preventing high I/O intensity jobs to be brokered on sites without the input data on the local storage and / or low network connectivity.
- Variations of the I/O limit is heavily affecting the global network utilization
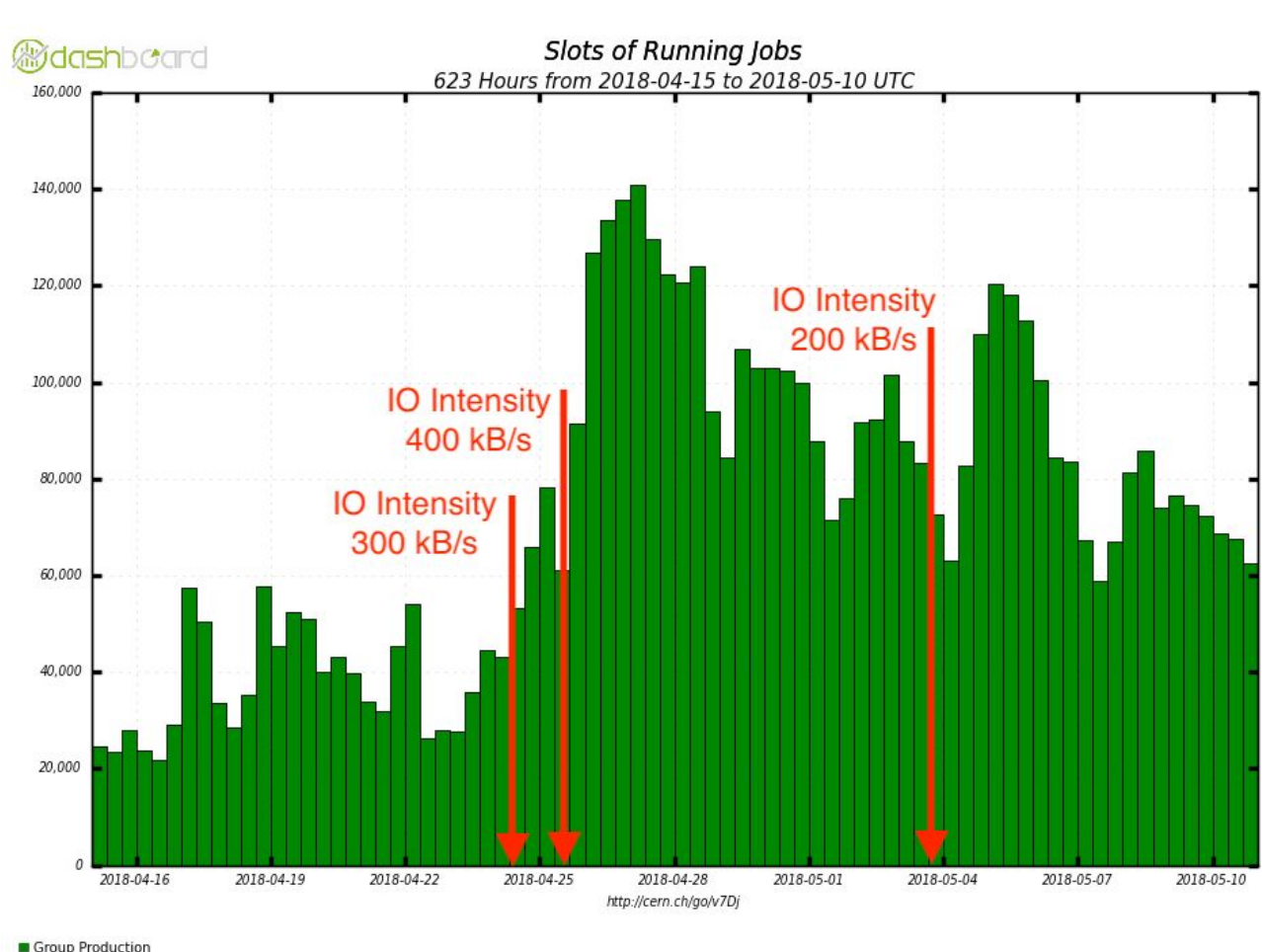

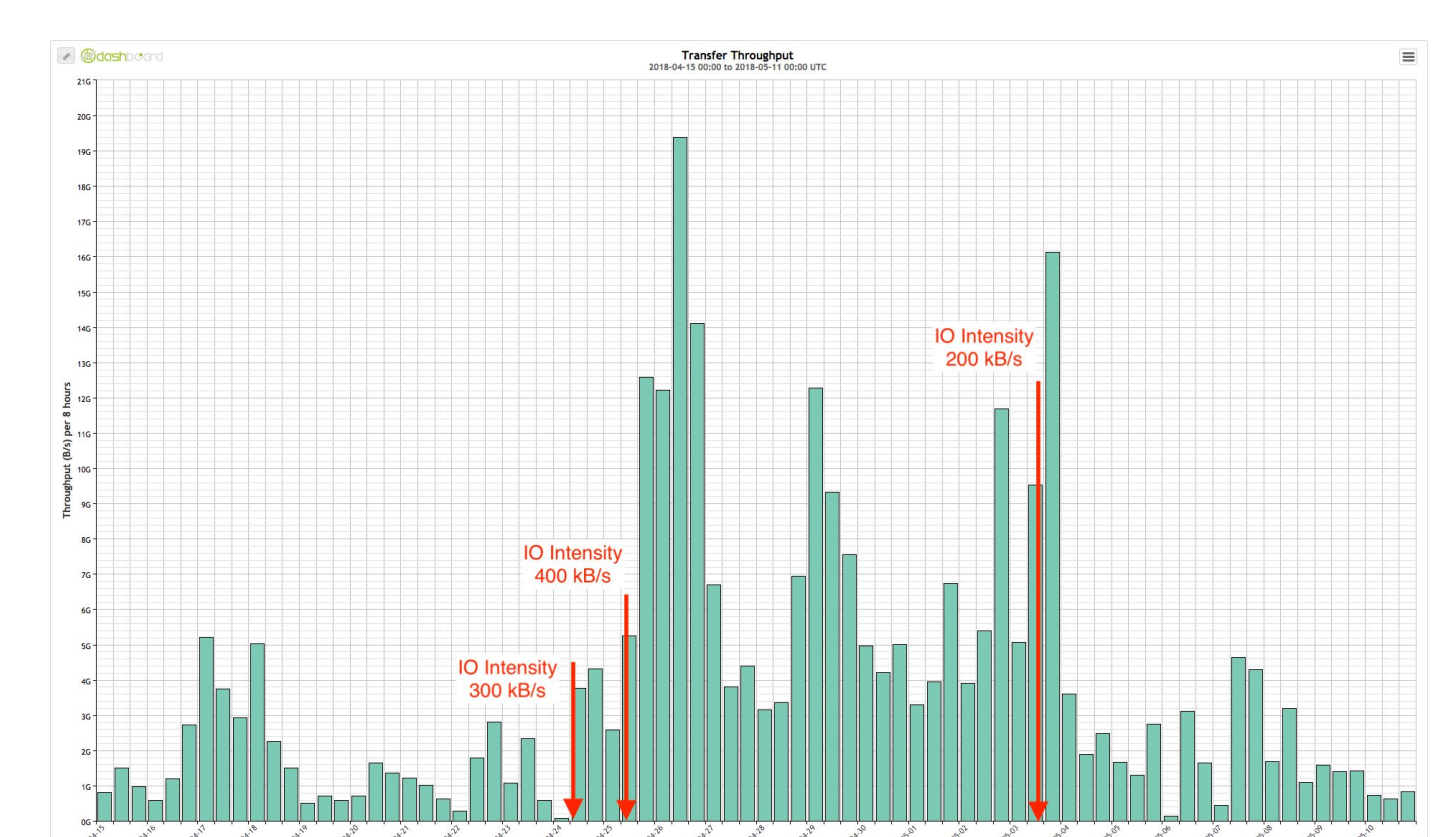Fig.6 Effect of I/O efficiency variations to the number of running job slots.

Fig.7 Effect of I/O efficiency variations on the production input transfer rate.

Optimizations: Panda Retrial Module

- Each job can be retried n number of times, where n is defined by the user
- Retrial module allows the operation team to limit or altogether forbid the retrial based on the failure of a given retry.
- Web UI
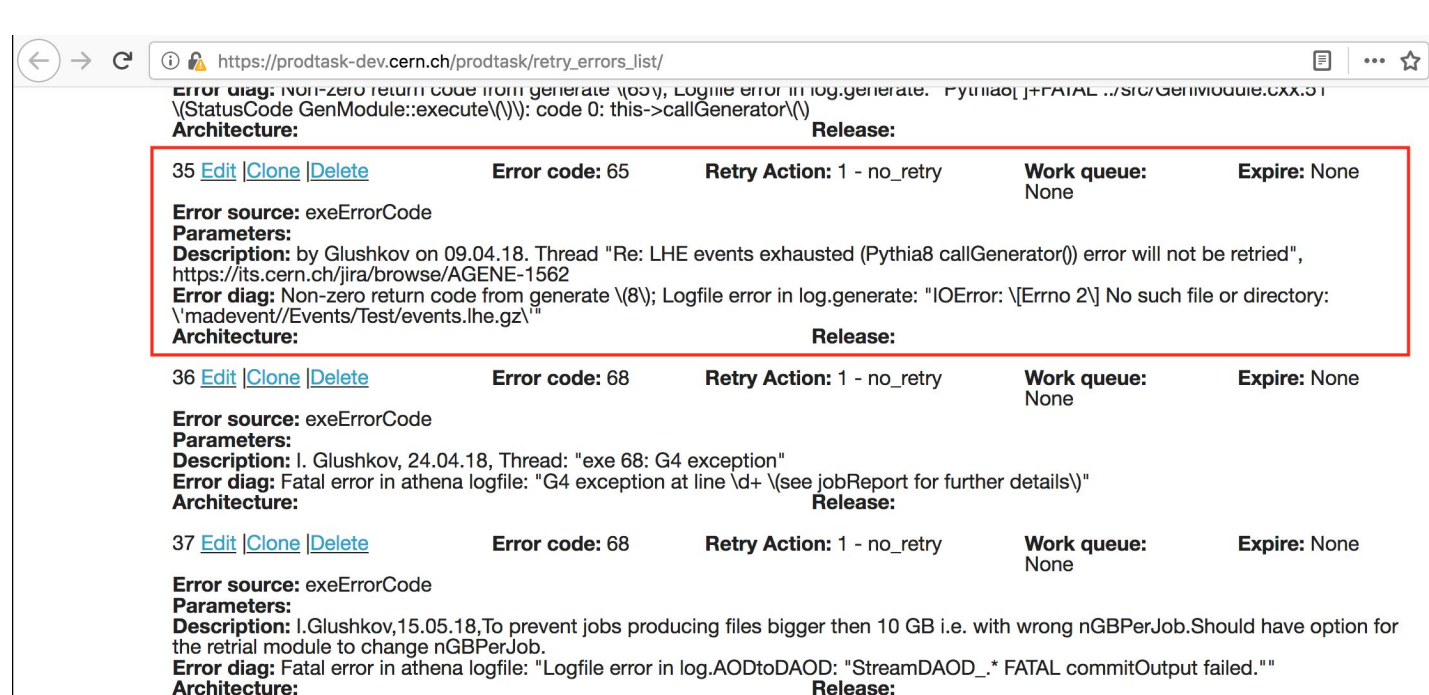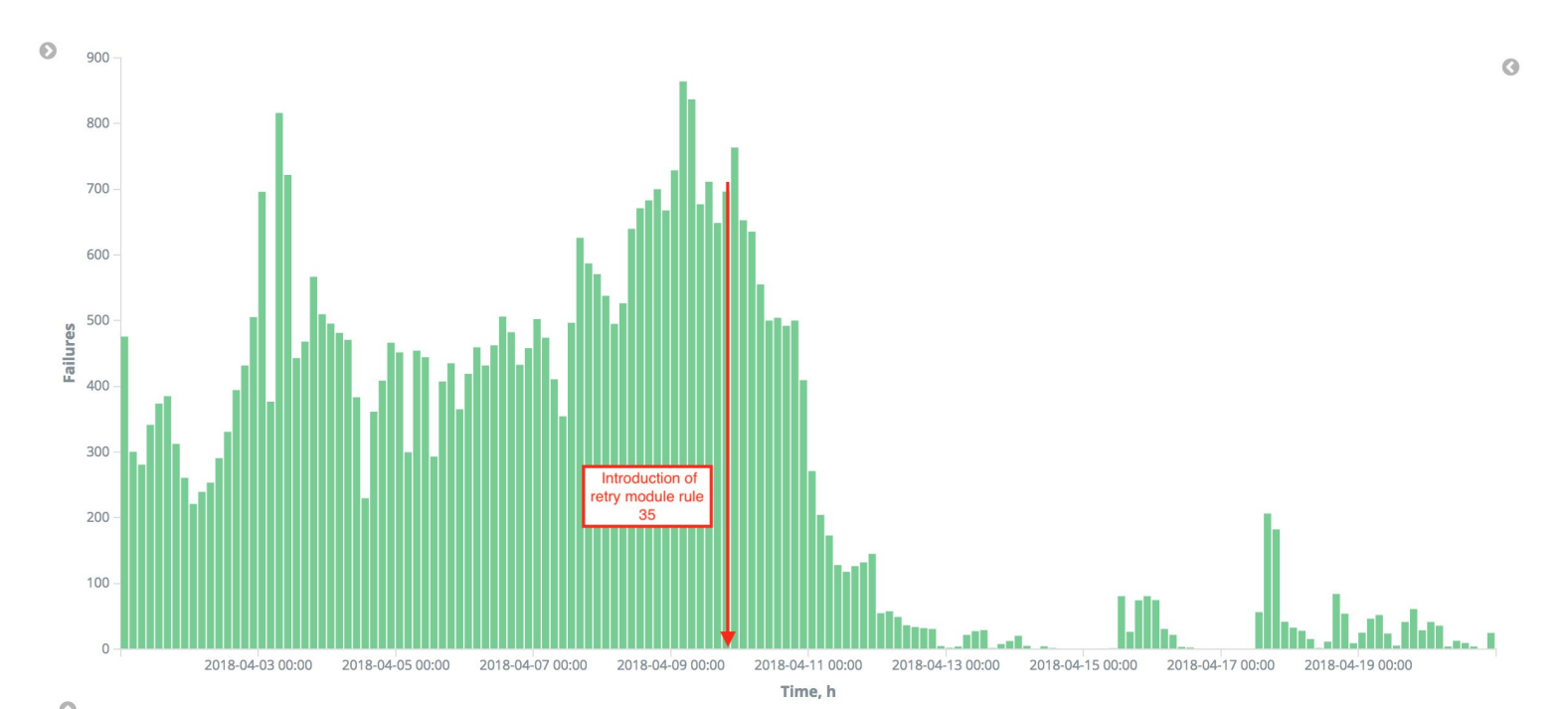

Fig.8 Web UI snapshot of Panda Retrial Module Web UI

Fig.9 The impact of the introduction of a retrial module rule over the corresponding failure's rate

References:
[1] "Overview of the ATLAS distributed computing system", J. Elmsheuser et al., CHEP 2018, Sofia
[2] "Advances in ATLAS@Home towards a major ATLAS computing resource", D. Cameron et al., CHEP 2018, Sofia
[3] "ATLAS Global Shares Implementation in the PanDA Workload Management System", F. Barreiro Magino et al., CHEP 2018, Sofia

ATLAS EXPERIMENT