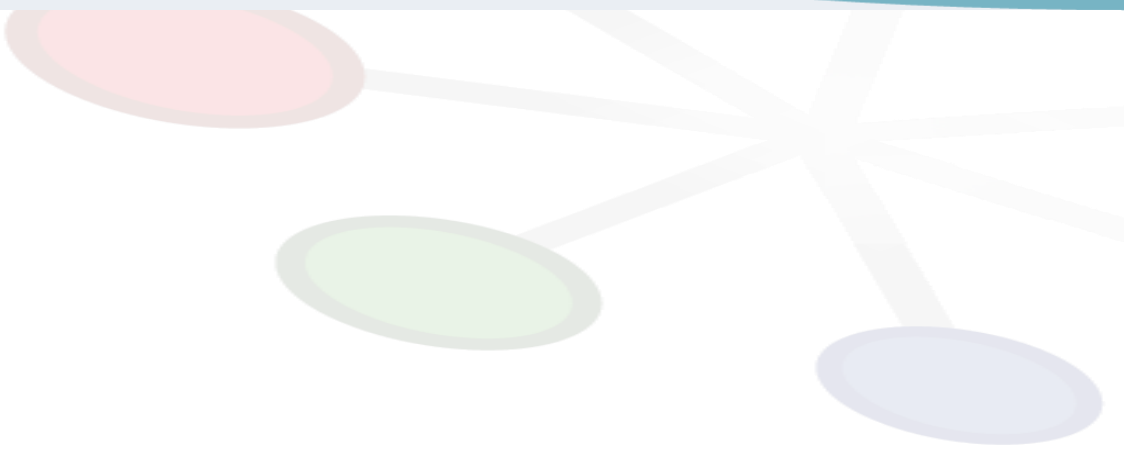




Data Management





- Data placement policy
 - From 2 to 4 replicas depending on popularity
 - Mitigate extremely good LHC efficiency with 2 replicas for real data (for now)
- Disk replica reduction / removal
 - Based on Data popularity
 - For active datasets, 2 replicas is the bare minimum, 4 the maximum
 - Criterion is data accessibility and availability
- Data federation (only for user analysis jobs)
 - Ensured by *Gaudi data federation*
 - Works very well, transparent to users
 - Remote replicas used if local replicas not available
 - User jobs brokering still based on best knowledge data location: jobs to data
 - From file / replica catalog
- Much SRM-based still
 - ...but trying to avoid SRM as much as possible
 - In the works, for data movement input and job tURL de-referencing



- **Storage reliability**
 - **Disk storage used as temporary storage**
 - Before merging and transfer to more permanent storage
 - As pre-staging for tape datasets processing (could be lower level of service)
 - **Important to not lose data (before merging) ⇒ requires reliability**
 - Heavy burden to reconstruct it
 - **Tape data loss may be dramatic ⇒ requires reliability**
 - Used for reconstruction output (single replica)
- **No dynamic removal / replication**
 - Reaction time scale too slow
 - Not easy to optimize number of replicas (≥ 2 , but...)
- **Resource reporting**
 - **Need reliable storage usage and availability information**
 - Currently SRM based
- **Data formats**
 - **Reduce as much as possible event sizes for each use case**
 - Using μ DST more and more for simulation
 - Turbo processing: directly use online reconstructed data



- Popularity used for removing datasets from disk
 - See talk-295 @ CHEP
 - Removed > 1.5 PB of disk replicas in 2016
 - Minimum number of replicas difficult to optimize
 - Intermediate step with 1 replica before full removal
 - Always keep one tape archive replica
- Users do use local (private) caching
 - Moving datasets to local storage
 - Non-pledged resources, no central operation
- Data parking
 - For LHCb this means
 - Wait before processing data (e.g. until next LS2)
 - Process when enough disk and CPU available
 - "Smart parking": select physics channels to be parked
 - ▾ Already done for some 2016 Turbo data (Charm physics)
 - Better than not record data
 - Arbitration not easy (management)