

# WLCG ATLAS Networking

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With focus on ATLAS:  
Summary of pre-GDB + some bit and pieces

# pre-GDB on Networking

- mid-January (just few days ago)
- <https://indico.cern.ch/event/571501/>
- 3 sessions:
  - Sites and Operations
  - Experiment Session
    - That's the bit for today
  - Future Network Capabilities Session

- CMS uses a dynamic data management system that heavily relies on reliable networks (assumes WAN bandwidth is ~infinite)
  - We can manually manage the cases where this isn't true.
- CMS increasingly relies on its data federation to increase effectiveness of production activities.
  - Workflow management system supports “overflow” jobs via reading from WAN
  - Now being done ~20% level and trans-Atlantic is being explored; future ~50%!
- Uncertain how computing model evolution will impact the network.
  - More data will require some appropriate scaling of network capacity for Run 3 (x5-10?!)
- There is interest in exploring new network capabilities:
  - How to increase network utilization as needed? Improve network consistency?
  - How to inform the workload management system about the network and vice-versa?
- Lots of uncertainty about Run 4; we know flat-budgets, zero-sum reallocations
  - R&D welcome starting now (much more “R” than “D” in the near term)

# **LHCb**

- LHCb's requirements will continue to be modest compared to ATLAS/CMS
  - Tier-0 In/Out **70/400 MB/s** average, **200/1200 MB/s** peak
  - Tier-1 site **70 MB/s** average, total **500 MB/s** peak; Tier-2 site **50 MB/s**, total **140 MB/s**
  - **NOTE: Mostly European resources; has implication for global network requirements**
- We expect data requirements (including data transfers) to go up by about an order of magnitude for Run3.
  - We expect to continue the same pattern as now at the Tier-0/1/2 sites
  - **We don't have any requests for addressing missing network capabilities.**
- Network monitoring is an area of strong interest for LHCb; Goals:
  - Monitoring of network activities on the network layer
  - Have precise information whether a problem is network related or have a different cause
  - Optimize data transfers
  - LHCb including additional network monitoring tools in the next release of DIRAC.

- Raw data replication from T0 to T1s (LHCOPN)

- 7PB (2015; **250MB/s** avg), 5.3PB (2016; **190MB/s** avg)
- 10% to Asia, 90% to Europe T1s
- Expecting similar rates thru Run 2

2016 Avg	Written		Read	
Total volume	46PB		466PB	
Local	50%	0.7GB/s	98%	15.2GB/s
Remote	50%	0.7GB/s	2%	0.3GB/s

- Model 2 copies of output data

- located “near” src & each other
- 98% of reads stay within site; remote copy is “nearby”; networking “local”

- Run 3 triggerless; new O2 center and AF

- High incoming WAN traffic to AF ~50Gbps in total
- 1/3 of the raw data stored **only** on T1s; similar average rates as today
- The data distribution model will be modified, but not dramatically
- The additional network needs governed by the increased data amount.
- Number of sites/regions is not expected to grow significantly (only their capacity), thus network tuning is the key

Presentation of a [Google doc](#) from ATLAS discussion

- During 2016 **average global network use 20GB/s with 50 GB/s peak**
  - No large network increase foreseen for the rest of Run 2
  - Tier-1 sites have seen congestion and then upgraded. Current networking OK for Run 2
- ATLAS is not geographically restricted; dynamic use of resources globally
  - Maintains a network “closeness” matrix indicating observed network transfer capability
  - Needs improvement in incorporating and appropriately filtering additional network information
  - During 2016, ATLAS transferred: 52 PB **FROM** US/CA (1.5GB/s average, 3.3GB/s peak)  
406 PB **TO** US/CA (12.8GB/s average, 21 GB/s peak)
- Medium term (Run 3) ATLAS foresees richer data, more CPU, evolving model
  - Potentially correlated factors of x5, x3 and x2. Net result about factor of x10 in network use.
  - SDN should be explored to determine benefit for ATLAS
- Monitoring and “visibility” of the network is **critical** for ATLAS

# ATLAS Network brainstorming: more details

- <https://docs.google.com/document/d/1G7b87zJh3TL9Z4qeAUVF6oVTEgxWp7rAfTf2JbSe88/edit#heading=h.48dg0kl4y5vs>