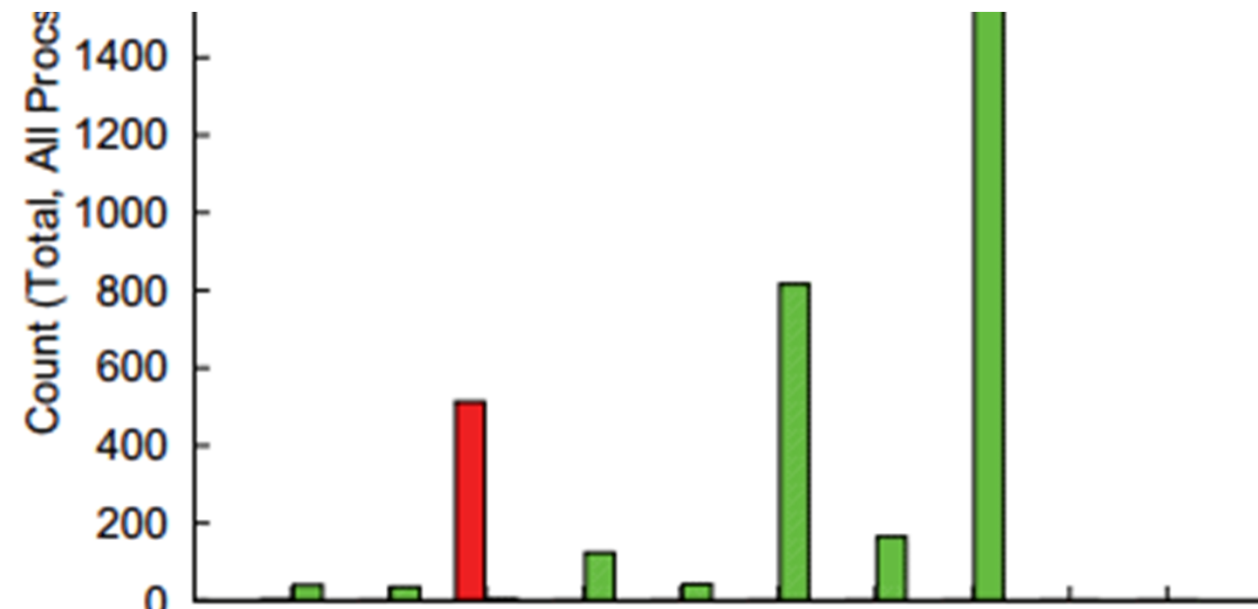


SC16 BIRDS OF A FEATHER SESSION



ANALYZING PARALLEL I/O



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November 16

Salt Lake City, Utah

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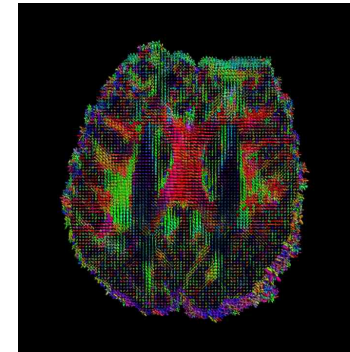
kunkel@dkrz.de

MOTIVATION FOR ANALYZING PARALLEL I/O

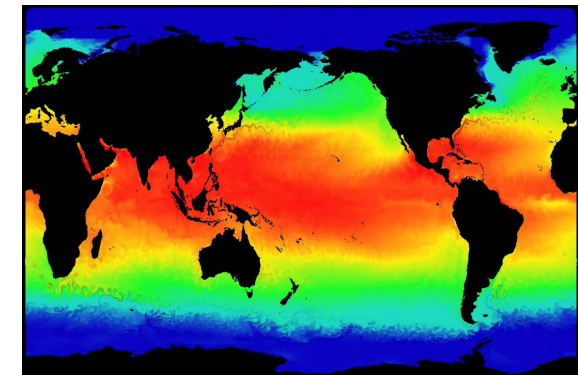
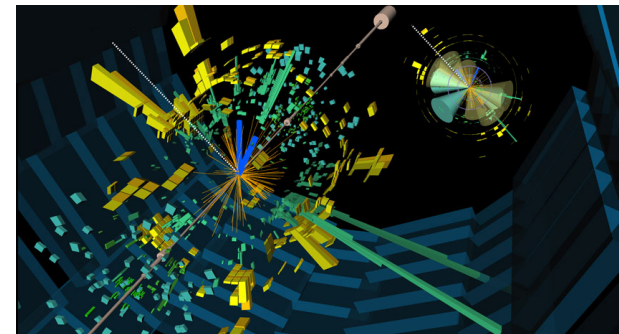
Times are changing in HPC storage!

- Many scientific domains are increasingly data intensive: climate, physics, biology and much more
- Upcoming platforms include complex, hierarchical storage systems

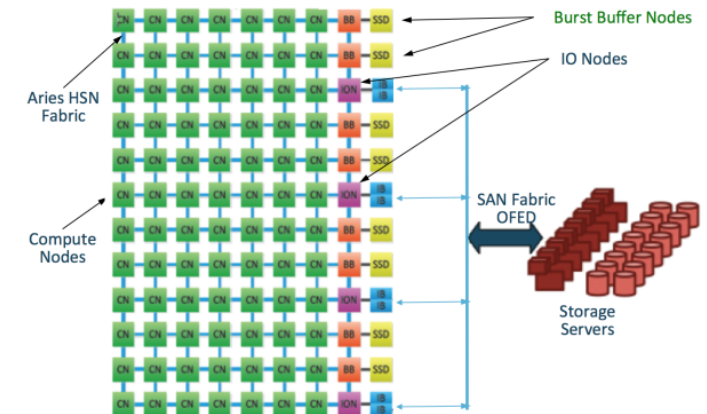
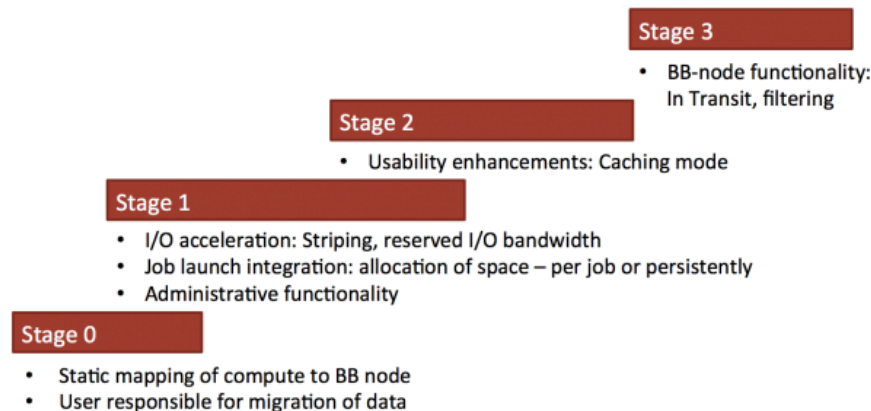
How do we maximize productivity in this environment?



Example visualizations from the Human Connectome Project, CERN/LHC, and the Parallel Ocean Program



The NERSC burst buffer roadmap and architecture, including solid state burst buffers that can be used in a variety of ways



KEY CHALLENGES

- **Instrumentation:**

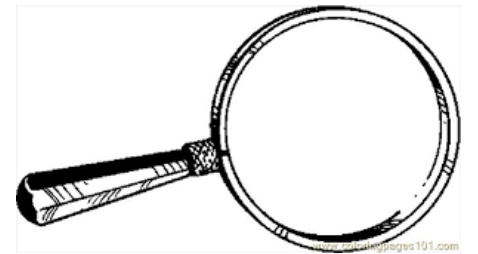
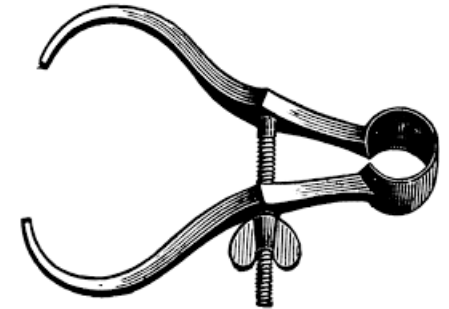
- What do we measure?
- How much overhead is acceptable and when?

- **Analysis:**

- How do we correlate multiple sources of information?
- What is the best way to store and index that information?
- Can we identify the root cause of performance problems?

- **Application** (e.g., how to apply what we learn)

- Develop best practices and tune applications
- Improve system software
- Design and procure better systems



IT'S A HOT TOPIC

Papers related to analyzing parallel I/O at SC16

- "Methodology and Application of HPC I/O Characterization with MPIProf and IOT" by Chang et. al. (ESPT)
- "Modular HPC I/O Characterization with Darshan" by Snyder et. al. (ESPT)
- "Parallel I/O Characterisation Based on Server-Side Performance Counters" by Sayed et. al. (PDSW-DISCS)
- "Replicating HPC I/O Workloads with Proxy Applications" by Dickson et. al. (PDSW-DISCS)
- "Server-Side Log Data Analytics for I/O Workload Characterization and Coordination on Large Shared Storage Systems" by Liu et. al. (SC main program)
- Also a factor in several BoFs, including yesterday's "Burst buffers: early experiences and outlook"

WHAT WILL WE ACCOMPLISH TODAY

- Several guest speakers will introduce state of the art tools and techniques
 - Shane Snyder (ANL)
 - Glenn Lockwood (LBL)
 - Salem El. Sayed (JSC)
 - Jacob Lüttgau (DKRZ)
 - Julian Kunkel (DKRZ)
 - Xiasong Ma (QCRI)
- Community discussion
 - Questions, suggestions, and comments
 - Ask the speakers about their work
 - Identify gaps and areas for improvement in the field
- The outcome of previous 2 BoFs has helped to guide our tools and research

DISCUSSION

Help the community to solve ongoing challenges

Ask questions in person or using “ask a question” link in program:

<http://sc16.supercomputing.org/presentation/?id=bof143&sess=sess348>

- Requirements for future tools?
- How much overhead is acceptable?
 - In production?
 - In debugging/profiling runs?
- What kind of information about I/O accesses is of interest for users?
- Should I/O tools be integrated into system monitoring?
- Should we share more tools with the general server/enterprise market?
 - (If so, how?)
- What kinds of applications are not well served by current tools?

THANK YOU!
FOR MORE INFORMATION SEE
**[HTTP://WR.INFORMATIK.UNI-
HAMBURG.DE/EVENTS/2016/BOF-MONITORING](http://wr.informatik.uni-hamburg.de/events/2016/bof-monitoring)**