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Wrong with the Datapath for Petascale Storage Systems?

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PDSW SC07

Data Reliability

Silent data corruption

- **Undetected errors**
- **Mis-corrected errors**
- **Is it hardware is it software**
  - *Where is it*
  - *What caused it*

Per-file error detection and correction is required from file creation through the life of the file

- **Common and open error correction algorithms throughout the system**

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Undetectable Bit Error Rate (UDBER)

UDBER	Sustain Transfer Rate Per Second for a Year						
	0.5 GB/sec	1 GB/sec	10 GB/sec	100 GB/sec	1 TB/sec	10 TB/sec	100 TB/sec
1.E-21	0.0	0.0	0.0	0.0	0.3	2.7	27.1
1.E-20	0.0	0.0	0.0	0.3	2.7	27.1	270.9
1.E-19	0.0	0.0	0.3	2.7	27.1	270.9	2708.9
1.E-18	0.1	0.3	2.7	27.1	270.9	2708.9	27089.2
1.E-17	1.4	2.7	27.1	270.9	2708.9	27089.2	270892.2
1.E-16	13.5	27.1	270.9	2708.9	27089.2	270892.2	2708921.8
1.E-15	135.4	270.9	2708.9	27089.2	270892.2	2708921.8	27089217.7

This does not include errors as hardware degrades such as a failing drive or controller
Bit error rates of most channels are 10E12

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Standards Process Seem Disjointed

No standards for

- *File systems*
- *HSM policy*
- *Per-file metadata*
- *What about accounting (need projectID)*

Lots of different standards bodies:

- *T-10, T-11, T-13, IETF, SNIA, OpenGroup etc etc*
- *No coordination of the layers for errors*

No standards for error correction for each file

- *In the file system nor an archive*

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Operational Error Management Needed

Collection, coordination and management of errors

Proactive error management

- **For example many RAID vendors hide SMART data from system manager**
  - **Self-monitoring data provided by hard disks**

Frameworks to track and manage errors and warning throughout the system

- **Tracking things like data corruption and DIF errors (for example)**

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