



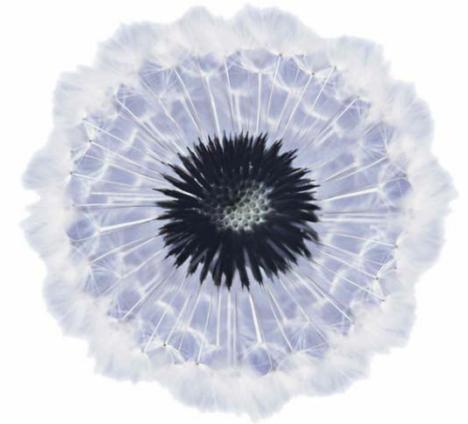
NetApp™

Go further, faster

Failure Panel: Reliability @ Exascale

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Observations

- Common (perhaps constant) *component failures*
 - Onerous to even physically replace failed components
 - New packaging: impacts hardware, software (say, RAID) design
- More *partial failures*, say silent data corruption
 - Will affect FS and applications (RAID checksums may not suffice)
- Significant increase in *operator errors*
 - Fewer *admins per TB* [OR] More admins (at many levels) coordinating
 - Automated config, config coordination, misconfig detection
- Larger impact for *software bugs*
 - May corrupt more data or cause larger scale data unavailability
 - Isolation and verification mechanisms
 - Systems' failure-handling should be optimized (e.g., fsck)
- *Change management*: hard, time-consuming, error-prone
 - Think of changing the file-system on-disk layout