Breakout 1 Summary

- Identified gaps in 4 research areas
  - FS-related protocols (19 participants: 11 edu, 4 gov,4 com)
  - Archiving (17: 9 edu, 5 gov, 3 com)
  - Management and RAS (20: 12 edu, 5 gov, 3 com)
  - Security (13: 8 edu, 4 gov, 1 com)
- Everyone ranked by relative importance
- Counted the votes
  - Five points for 1st, four for 2nd, etc

FS-related Protocols

	EDU (11)	GOV (4)	COM (4)	TOT (19)
Application level informing file system about access patterns, hints, could this be added to POSIX? (Need both inform and react, Layouts)	1 (47)	1 (17)	1 (20)	1 (84)
Info going up from the system to the applications. (generalized interface to gain information) this includes networks and storage	2 (43)	1 (17)	2 (15)	2 (75)
Applications level api (user space or not)/file system level api to RDMA (be careful, this is littered with blood)	3 (36)	3 (14)	3 (13)	3 (63)

Archiving

	EDU (9)	GOV (5)	COM (3)	TOT (17)
Alternate interfaces to archives including all the way down to the storage hardware	1 (25)	6 (6)	2 (8)	1 (39)
Posix standards interfacing to archives, policies on files/directories	3 (18)	1 (13)	3 (7)	2 (38)
Reliability issues with using devices in archives	2 (23)	4 (9)	7 (1)	3 (33)
Map reduce, applied to archives	4 (15)	4 (9)	5 (5)	4 (29)
VFS layer and above for archive functions or other transparently/interoperable way to deal with archives and file systems	5 (14)	1 (13)	9 (0)	5 (27)
Automated attribute generation	6 (13)	3 (11)	6 (2)	6 (26)
There are commercial sites that want parallel archive, align with ILM activities	8 (6)	6 (6)	1 (12)	7 (24)
Standardize archive attributes	7 (9)	8 (4)	4 (6)	8 (19)
Compression/navigation of snapshots?	8 (6)	9 (0)	7 (1)	9 (7)

Management and RAS

	EDU (12)	GOV (5)	COM (3)	TOT (20)
Dissemination of reliability information	1 (25)	1 (12)	7 (3)	1 (40)
Failure testing / more formal failure analysis is needed, not a solved problem	2 (23)	3 (11)	5 (4)	2 (38)
No semantics for async events completion (write that completes 20 minutes later), programming models that deal with this, can internet data providers POSIX semantic relaxations be of value to HEC, etc.	4 (15)	1 (12)	2 (8)	3 (35)
Autonomics is not a solved problem by any stretch	3 (21)	9 (3)	1 (10)	4 (34)
Prediction/Benchmarking/correctness testing in the continuous failure (in degraded performance mode and when data is not really available)	5 (13)	6 (6)	2 (8)	5 (27)
Running no matter what fails, performance tolerance	5 (13)	7 (5)	4 (7)	6 (25)
Failure signatures/prediction/tools for root cause detection	9 (11)	3 (11)	8 (2)	7 (24)
Failure models	5 (13)	5 (9)	9 (0)	8 (22)
Exploiting network for data capturing	8 (12)	10 (1)	9 (0)	9 (13)
Rebuild/fsck times/read error rates compared to rebuild amount/trade off capacity vs performance	11 (8)	8 (4)	9 (0)	10 (12)
you determine how simple of model you can use to evaluate, quantify difference, how do you understand how much error the model has and how that effects you.	10 (9)	10 (1)	9 (0)	11 (10)
Replication/availability management	12 (5)	12 (0)	5 (4)	12 (9)
How can non disk storage devices be used to help with RAS/Mgmt	13 (0)	12 (0)	9 (0)	13 (0)

Security

	EDU (8)	GOV (4)	COM (1)	TOT (13)
Tracking the path of information as it flows through the system, knowing how bad the damage is, born on dates, pass through stamps, etc. aggregation (Under the assumption that bad things WILL happen, Recovery from these things efficiently)	2 (19)	1 (17)	1 (5)	1 (41)
Long term key/crypt/algorithm mgmt issues, re-encrypting in stronger keys, etc. *** this makes this problem different than normal crypt problems (evolution of security)	1 (20)	2 (11)	6 (0)	2 (31)
Performance/scalability overhead	3 (13)	4 (7)	5 (1)	3 (21)
Research on resilient security, make it so you have to break more than one security mechanism to make it a serious issue	4 (10)	5 (4)	2 (4)	4 (18)
Usability	7 (7)	3 (8)	6 (0)	5 (15)
Need standards for secure deletion, balance performance versus disk overwrite for delete, actual device commands that allow real secure deletion to really overwrite for sure, and making sure you have all the copies/related information.	7 (7)	5 (4)	3 (3)	6 (14)
Understanding composition of security as it applies to end to end security	4 (10)	9 (0)	4 (2)	7 (12)
Explore Quality of Security	6 (8)	8 (3)	6 (0)	8 (11)
Searching and indexing encrypted data, very hard problem	9 (5)	5 (4)	6 (0)	9 (9)