Breakout #1 Summary

Technical Roadmap Discussion (1/2)

- HPC Architecture Roadmap
  - What process do we use to create it?
  - What are the key components that affect software
  - What can we have done by the June meeting, & this year?
  - Who will do it?
  - Multiple paths?
- HPC Software Roadmap, Gaps, and CS research strategy
  - What process do we use to create it?
  - How should we improve software inventory? (acceptance test data?)
  - What does this community have leverage on (I/O, fault tolerance)
  - What are the key components
  - What can we have done by the June meeting & this year?
  - Who will do it?
  - How do application teams participate?

Technical Roadmap Discussion (2/2)

- Gather and analyze existing R&D plans for addressing extreme scale
- How does it match with the roadmap?
- What is missing?
- With software/hardware co-design, what can we address first?
- What are the key new features that need the most R&D:
  - E.g: power mgmt, multicore tools, math libraries, advanced memory models, etc
- What is unique for our environment? (I/O, prog model)

Discussion

- Aims
  - CERN-like approach to development of an exascale system

    vs
  - Loosely coupled research and development

- Evolution vs Revolution path?
- How broad is the base?
- Do we focus on the single node computing model?

Discussion cont.

- The user-base we consider will effect the approach – if it is only the bleeding edge then many of the things we talked about yesterday are not important.
- Different nations will have different focuses need to identify the specific strategic aims and how they may fit into a technical roadmap.
- For some key exascale applications, flops is not the primary performance metric, eg graphical operations per sec – need to come up with appropriate metrics.

Discussion cont.

- We should develop a roadmap for the entire ecosystem of exascale leadership systems, petascale departmental, and terascale embedded to reap the broader benefits from the exascale software development.
- We need to identify the key applications to drive the technical roadmap.
- Working closely with vendors is key to success and we have the opportunity to develop hardware /software co-design

Meta Technical Issues

- Increase in scale
- Heterogeneity
- Efficiency
- Memory
- Co-design (hardware/software)
- Intelligent Metrics
- Dynamic adaptability

Cross cutting functional issues

- Resilience (reliability & fault tolerance)
- Performance
- Programmability
- Computational model
- I/O
- Consistency & verification
- Resource Management
- Power management

Actions

- One page description of cross cutting issues
- One page on co-design – Sudip Dosanjh & Al Geist
- Development of software and activities registry – Pete Beckman & Bernd Mohr & Anne Trefethen & Mike Heroux & Jean-Yves Berthou
- How to revolutionize process used – integrating into programme – Bill Kramer & David Skinner
- End-to-End usage workflow and workload analysis- David Skinner & Alok Choudary
- Develop software taxonomy – Vivek Sarkar & Barbara Chapman & Alok Choudary
- Identify collaborator roles in technical R&D – David Skinner & Anne Trefethen
- Further down road risk analysis & external review
- Strategic decision – one track or two track approach
  - Define shareable and distinct activities - ???

Cross cutting issues

- Resilience (reliability & fault tolerance)
  - Al Geist & Bill Kramer & Nick Nystrom & Sudip Donsanjh & Franck Cappello
- Performance
  - Wolfgang Nagel & Bernd Mohr & Nick Nystrom
- Programmability
  - Vivek Sarkar & Jesus Labarta & Mitsuhisa Sato & Barbara Chapman
- Computational model
  - Thomas Sterling
- I/O
  - Yutaka Ishikawa & Bill Kramer & Alok Choudhary

Other issues

- Consistency & verification
  - David Skinner & Bill Kramer
- Resource Management
  - Barney MacCabe & Hugo Falter
- Power management
  - Satoshi Matsuoka & Dan Reed