

*September 17-18, 2008 in San Francisco, California*

**Risk Management Techniques and Practice Workshop**  
*for High-Performance Computing Centers*

Track 1, Session 4  
Tailoring Risk Management to HPCCs

**Session 4: Mitigation & Contingency Planning**  
**“Know when to hold them and when to fold them.”**

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“The essence of risk management lies in maximizing the areas where we have some control over the outcome, while minimizing the areas where we have absolutely no control over the outcome and the linkage between cause and effect is hidden from us”

- Against the Gods: The Remarkable Story of Risk
  - Peter Bernstein

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# Session 4 Participants

Cupps	Kim	LLNL	LEAD
Ballance	Bob	SNL	LEAD
Antypas	Katie	NERSC	NOTES

Andersen	Aaron	NCAR	Ang	James	SNL
Baker	Ann	ORNL	Beldica	Christina	NCSA
D'Aoust	James	SDSC	Draney	Brent	NERSC
Featherman	David	BAH	Kendall	Ricky	ORNL
Kramer	William	NERSC	Lee	Sander	NNSA, DOE/HQ
Leininger	Matt	LLNL	Monsein	Jonathan	DOD
Scherr	Stephen	DOD	Saiyed	Sohel	IBM
Stelljes	Kevin	Cray	Tinnin	Douglas	ANL
Verdier	Francesca	NERSC	Yip	Warren	Site Office, DOE

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# Key Questions

- Track 1
  - How well do the typical risks encountered in HPCC fit the standard (your area)
  - Key Lessons Learned
  - Best Practice Models for HPCC (in your area)
  - Opportunities to share / improve practices and terminology
- Session-specific questions
  - What are the standard mitigation/contingency techniques for HPCC?
  - What triggers can be used for starting, boosting, or stopping a contingency or mitigation activity?
  - What is the best way to gum up the risk management process?

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# Initial Plan of Action

- Introductions
  - What brings you here?
- Discussion
  - What's the difference between a mitigation and a contingency?
  - How does the statement of risk effect mitigations and contingency?
- Brainstorming
  - What are the standard HPC risk mitigation strategies?
  - What are the standard HPC contingency techniques?
  - What are the best practices that we should be using?
- Report out

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**Risk = Hazard/Safeguard**

- 1 Kaplan and Garrick, “On the Quantitative Definition of Risk”, 1981.

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# Thought questions

- Brainstorming
  - What are the common hazards that we encounter in HPCC?
  - What safeguards do we commonly apply?
- Discussion questions
  - How well do the safeguards work in practice?
  - Are there alternative approaches that might work better?

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# More thought questions

- What triggers can be used for starting, boosting, or stopping a contingency or mitigation activity?
- What is the best way to gum up the risk management process?
- What fraction of the acquisition budget should be allocated to risk mitigation & contingency activities?
- What happens when risk mitigation activities become, themselves, risks?
- To what extent are risks and control techniques independent?

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# Conversation

- Differences from industry
  - One of a kind facilities, not been done before
  - Incremental & unstable funding/staffing
  - Large number of stakeholders able to influence design, methods, complexity
  - Schedule risk in HPC is high because lifetime of system is short
  - High Visibility, scrutiny
- Mitigation, contingency plan, and workarounds
  - “Contingency” is a tricky concept
  - We decided it was a bad word.

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# Process

- Heavy use of brainstorming
- Conspicuous consumption of post-it notes
- Early clustering analysis
- Detailed discussions of clusters

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# Results

- 17 group members
- 70+ proposed best practices!
- Thanks Katie!
  - (She is the person still doing data entry in the back)

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# Project Management

- Define authority to make decisions
- Employ a wide range of staff/users/expertise
- Involve diverse group of people from RFP through Acceptance and beyond
- Support frequent open collaborative/ non-hostile reviews
- Document roles and authority in project plan
- Require risk handling status as part of the weekly executive level PM status meetings
- Have a defensible budget
- Develop a risk management working group to share risks/opportunities/lessons learned across projects in the same portfolio/enterprise
- Obtain and maintain solid management support
- Define triggers to initiate/boost/stop mitigation efforts

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# Contracts, Procurement, and Acceptance

- Proactively engage vendors
- Contractual performance requirements
- Allow vendor flexibility to exchange performance for schedule
- Consider advanced and mile stone payments
- Have, Know, and Understand plan B
- Use real applications for acceptance testing
- Integrate performance measures over time
- Make performance on equal playing field with usability, effectiveness, consistency and reliability

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- Transfer/share risk to vendor  
shared development, shared source code
- Locate vendor risk customer can easily mitigate
- Keep communication lines open with vendor/ explore all options
- Understand vendor's risk, track in risk register
- Understand vendor's cost as best you can
- Ensure multiple-vendor procurements and bids
- Define benchmarks appropriate to Test System/Factory Test
- Buy a maintenance plan from vendor

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# Strategies

- Maintain a diversity of systems
- Parallel Development to Reduce Risk
- Use outside experts

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# Communications

- Status updates / meeting with vendor
- Talk not only with direct vendors, but subcontractors and explore all options
- Communicate with other Centers
- Ideally make problem reports with vendors public
- User group communication (although SC BOF on this rejected)
- Share and document lessons learned
- Share software, including diagnostics

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# Facilities

- Negotiate future operating costs if possible
- Hire commissioning agent as 3rd party
- Outside engineer, perhaps not available in house
  - Independent party
  - Cost prohibitive?
  - Mitigates contract problems?

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# Involve Users

- Form teams of interdisciplinary scientists to guide...
- Science driven systems
- Improve communication between users and centers
- Communicate with future users early and often
- Set expectations for multi-core, lower memory nodes, system performance, etc.
- Encourage users to scale codes/ try new strategies
- Map user applications to appropriate resources

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# Others

- Add more resources
- Cut back on scope
- Track Technology
  - Use agency resources
  - Risk Identification
- Pray a lot

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- \*Pull team of technical experts together to craft safeguard strategy
- Several funding options specified in contract to mitigate funding changes
- Offramps in contract to share risk - either party can get out a certainpoints, no harm no foul
- Take advantage of other agency technology tracking
- Remember not all risks are negative
- Very few mandatory requirements in RFP - reduce possibility of no successful bids
- Transition to operations test suite
- Use acceptance tests and friendly users
- Keep some functions in house, facility mechanics/electricians to maintain flexibility

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- Use "observational approach" as opposed to complete site characterization
- Integrate computer security concepts and personnel early in acquisition process
- Offer resources to vendor partners for system update testing at scale; vendor do not have resources for full scale testing in house
- Strive for a balanced system
- Identify weak points in vendor supplied software ahead of time and fill those gaps in house, 3rd party
- Regular progress meetings with vendor site with both management and technical teams
- Bring in partners with unique expertise
- Make vendor responsible for providing 3 years of spare parts independent of failure rates

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# “Uncovered” risks in session

- Applications not ready
- Staff - Key people leaving and going to other centers
- Users won't move to new systems
- Some performance hazards
  - Esp. operations-related

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# Four standard approaches to risk

- Assume - accept the risk as is and hope for the best
- Avoid - change course (design, vendor, etc.) to take the risk out of the equation
- Mitigate - do something proactively to reduce the likelihood and/or consequence of the risk
- Transfer - pass the buck to someone else (an insurance policy is the classic example)

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# Mitigation, contingency and workaround

- Mitigation - proactive attempt to reduce the likelihood and/or consequence of a risk event
- Contingency - plan to change/revise an unsuccessful mitigation strategy...initiated once a pre-defined threshold is exceeded or trigger event occurs
- Workaround - reactive approach to a realized risk...implementing Plan B when Plan A has failed (or there was no Plan A)

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# Session 4 – Risk Mitigation and Contingency Planning

- What triggers can be used for starting, boosting, or stopping a contingency or mitigation activity?
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