Return on Investment for HPC Systems in the Research Environment

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Research is Different

- Classical ROI doesn't fit
  - Costs are (usually) known; benefits are not
  - Null research results give zero apparent benefit
- Research benefits are real but delayed
  - Academic studies have shown average rate-of-return on research may be 25-30%
- Many organizations fund research as percent of revenue or budget
  - Level of effort with many small projects
- How to justify and pay for HPC investments?

In Research Environment "Pay by the Pound" for HPC Doesn't Work

- HPC has large ratio of fixed to variable cost
  - High fixed capital acquisition cost
  - Typically fixed maintenance cost
  - Can't easily adjust capacity to varying workload
- Full cost may not be recovered from variable workload
  - Pricing assuming full use may not yield enough revenue if usage fluctuates
  - Pricing assuming partial use may drive users away because perceived cost is too high

Fund HPC as Strategic Resource

- Fund capital and other fixed cost as a budget line
- Consider opportunities for variable pricing similar to yield management practices of airlines
- Pick one of several approaches to allocate computing resources
  - "Pay by the pound" that covers variable costs
  - Resource grants, perhaps based on reviewed proposals

Decide on Scope and Approach

- The easy case: HPC is embedded in single program that justifies investment as part of its program plan
- The hard case: HPC needs are spread over several programs that must agree on funding, approach, and distribution of resources

Build Management Case for Capital Funding

- Typically the case is based on projection of future benefits with proof based on past accomplishments
- Engage experts to develop the case who can bridge between computational science and management expectations
- Management will look for tradeoffs between HPC and other approaches
  - e.g. experiments

Sustain Management Commitment

- Try to achieve quickly a few impressive results from newly installed systems that justify the expense
  - Justification by anecdote
- Keep the good results coming
  - encourage even long-range projects to deliver intermediate results
- Repeat the justification cycle

Avoid the Death Spiral

- Management says let the users pay for resources they need
- Provider tries to set a price that covers full cost including replacement
- Users can't pay enough out of individual research budgets to cover full cost
- Computers become obsolete
- Users abandon large computers
- Researchers fall off the HPC curve

Summary

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- In Research Environment “Pay by the Pound” for HPC Doesn’t Work
- Fund HPC as Strategic Resource
- Decide on Scope and Approach
- Build Management Case for Capital Funding
- Sustain Management Commitment
- Avoid the Death Spiral