IESP Software Break
Day 2

Oxford

Software Efforts:
Exascale Uniqueness and Criticality

Unique-to-Exascale/Non-critical
•**Explicit long term funding**
•**Explicitly managed**

Unique/Critical
•**Explicit near term funding**
•**Explicitly managed**

Exascale+trickle-down/Non-critical
Funding?
Management?

Exascale+trickle-down/Critical
Funding?
Management?

Non-Unique/Non-critical
•**Other party funding**
•**Moderately Tracked**

Non-unique/Critical
•**Other party funding with explicit funding contingency**
•**Explicitly tracked**

Write-up Template Elements

- For each activity:

  - Justification/rationalization of uniqueness/ criticality.

- Procedure:

  - Look at current draft report.

  - Generate narratives of the results of this meeting with classification in mind.

  - Update the draft accordingly.

HW Configuration strawmen

- Need information on potential system design tracks.
- What is the best way to engaging vendor community in the codesign process with IESP?
- Suggestions:
  - Continual interaction (based on experience in embedded env).
  - Embed postdocs in vendor environment?
- Example: What are the technologies we can use a baseline for I/O capabilities?
  - Service nodes spread out on the system.
  - Local NVRAM.
- New scenarios:
  - Example: Eliminate traditional I/O storage. Use NVRAM to replace disks.
  - What are the probabilities new scenarios will emerge? High, medium, low.
- New strawmen:
  - Kogge Exascale report
  - DARPA UHPC award
  - others in future
  - Expected design freeze 2015.

Applications

- Application roadmap needed for co-design.
- How do we prioritize applications?
- What are the critical apps?
  - Without which we fail.
    - Which of these are obviously scalable (low hanging fruit)? Will run on Day 1.
  - Beyond that, how much effort to get success?
  - How soon for the rest?
  - How do we decide within multi-agency environment?
- Alternative: From science perspective what are the priorities?
  - What are low hanging fruit?
  - What are the political priorities?
- How can we incorporate performance proxies, e.g. Motifs?

Program Management

- Funders monitor whole program.
- Critical dependencies throughout program.
- Who is going to manage, coordinate and monitor:
  - Internal dependencies?
    - Especially Codesign.
  - External dependencies?
- What is the level of engagement at the international level?
- What form of funding will be ideal?

R&D Timeline

- Long term timeline: 8-12 years.
- Challenge: Typically funding comes in 2-3 chunks.
- Can we obtain long term funding?
- Staged R&D effort?
  - Years 1-4:
    - Research focus,
    - Mostly unconstrained,
    - Multiple paths.
    - Evolution: Delivering on current systems.
    - Revolution: Early prototypes and demonstrations for future system.
  - Years 5-8:
    - Development focus,
    - Delivery oriented.
    - Start R&D for post-Exascale (pipeline).
  - Year 9-12:
    - Deployment and improvement.

Co-design Methodologies

- Exchange of people, co-location:
  - Example: Postdocs at providers. Providers at labs.
- Simulation, emulators, small scale prototypes:
  - Systematically part of co-design.
  - Each group: Determine what it can add to this process.
  - All parties need to make strong commitment, co-owned deliverables.
- Co-design should be explicitly planned, funded and managed.
- Co-design in HPC:
  - Need co-design approaches that support vastly complex effort (when compared to embedded approaches).
  - Need to understand the constraints on the design space.
  - Need to understand risks of co-design:
    - Example: Provider departing market.

Additional Topics Discussed

Exascale SW vs Commodity Node SW

- Much discussion about relationship between exascale needs/development and commodity needs/development.

- Can we factor efforts to depend on commodity?

Questions for Apps
Answer for short, medium and long term

- What kind of I/O will be needed by Apps?
- Will apps manage power and need an API?

New Programming Model Features

- Resilience model (with library extensions?)
- New Model of Computation?
  - Need to be explicit about roadblocks.
  - How will new model overcome them.

Risk vs. Likelihood

- Software Roadmap
- Deadlines
- Useful for our efforts?