IESP Software Break (1)

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Agenda for Today
Moving from “What to Build” to “How to Build”

• Technology
  – Refining the roadmap for software and algorithms on extreme-scale systems
  – Setting a prioritized list of software components for Exascale computing as outlined in the Roadmap

• “Streamlining”
  – Assessing the short-term, medium-term and long-term software and algorithm needs of applications for peta/exascale systems
Software Topics in the Current Roadmap

4.1 Systems Software
4.1.1 Operating systems
4.1.2 Runtime Systems
4.1.3 I/O systems
4.1.4 Systems Management
4.1.5 External Environments

4.2 Development Environments
4.2.1 Programming Models
4.2.2 Frameworks
4.2.3 Compilers
4.2.4 Numerical Libraries
4.2.5 Debugging tools

4.3 Applications
4.3.1 Application Element: Algorithms
4.3.2 Application Support: Data Analysis and Visualization
4.3.3 Application Support: Scientific Data Management

4.4 Crosscutting Dimensions
4.4.1 Resilience
4.4.2 Power Management
4.4.3 Performance Optimization
4.4.4 Programmability
Summaries from Roadmap from TSUKUBA

3-4 minute review of each SW topic from IESP Roadmap

- Gropp: Algorithms
- Skinner: Debugging
  - Bug avoidance part of this section?
- Heroux: Frameworks
  - Libraries are separate topic.
- Choudhary: I/O
- Choudhary: Scientific Data Management
- Dongarra: Libraries
  - Focus on very general-purpose libraries.
Summaries from Roadmap (p.2)

• Chapman: Programming Models
• Chapman: Compilers
• OS: Barney MacCabe
• Performance: Bernd Mohr
• Power: Satoshi Matsuoka
• Programmability: Hiroshi Nakashima
• Resilience: Franck Cappello
• Runtime systems: Jesus Labarta
Streamlining: Exascale vs. non-Exascale Discussion

- Limited resources available; hard decision
- Must differentiate between things that:
  - Industry will address independently/jointly.
  - We must address items uniquely exascale.
- Some things are both exascale and not (could be good or bad).
  - Some funding will require strong exascale focus.
  - Others will require both exascale and lower scale.
Agreed points

• Billion way parallel.
• 20MW power.
• Delivered in 2018.
• Need to ID critical SW elements.
  – What is absolutely necessary?
Streamlining the software components

Categorizations of Subcomponents

Overnight homework assignment for respective owners of the document of each subcomponent

⇒ Categorization at the topic level too coarse
⇒ Categorize their subtopics

• Category I: Uniquely Exascale
• Category II: Exascale plus trickle down (Exascale will drive)
• Category III: Primarily Sub-exascale (industry will drive)
Exascale Critical Path Identification (to be done tomorrow)

- Exascale Critical path
  - Fault tolerance.
- Not so critical, but very favorable
  - Autotuning.
- Not critical at all
  - ???
- May end up being identical to Category I, but at the least as a sanity check