

IESP Software Break (1)

Oxford, UK, 13. Mar 2010

Satoshi Matsuoka & Mike Heroux

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