

Workshop on Modeling and Simulation of Exascale Systems and Applications

Organizing committee:

Bill Harrod, Adolfo Hoisie, Darren Kerbyson, Bob Lucas, Arun Rodrigues, Sonia
Sachs, John Shalf, Allan Snavely, Jeffrey Vetter

August 9-10, 2012
Seattle, WA

State-of-the-field

- Significant progress is being made
 - The field is growing
 - Extraordinary pool of talent available in this general area
- Modeling and simulation is applied to performance
 - Just emerging to power
 - Reliability is almost an orthogonal dimension
- Analysis is still dominated by simple metrics, back-of-the-envelope approaches (efficiency, scalability, Amdahl's law, etc)
- A lot of use after the fact, less in design
 - Although few examples to the contrary exist
- Tools-of-the-trade in industry and open R&D not coordinated/calibrated
- Large number of generally small projects across application domains, funding agencies, academia/Labs/industry
 - With subsequent loss in efficiency
- Few larger “centers of emphasis”, including co-design centers

Technical Challenges

- Challenges of Exascale mandate new modsim capabilities
- Metrics: no longer just minimization of run time
- New methodology development
 - Dynamic modeling
 - Need to model power/performance/reliability in concert
 - Bridging the gap of scales (modeling/simulation boundary)
- Expanding the applicability
 - New architectures and technologies
 - Execution models
 - Introspective system software
 - New application domains, including big data, streaming
 - Emphasis on co-design throughout the stack
- Integration of methodologies into “tools-of-the-trade”
 - Lowering the modeling generation barrier with smarter tools

Future needs

- Build a community identity
- Integration with Exascale efforts (co-design, apps, arch, RT, PM...)
 - Modeling as a key technology
- Seamless integration of modeling and simulation to tackle Exascale co-design
- Ubiquitous modeling

Why are we here

- Survey the state-of-the-art in modeling and simulation
- Engage in in-depth technical discussions pointing to increased accuracy, coverage, and impact of modeling and simulation
- Discuss the architectural and application trends that are likely to materialize at Exascale and the ways to capture those in models
- Brainstorm out-of-the-box modeling alternatives and techniques for Exascale
- Identify the key areas of co-design where modeling and simulation can have a significant impact
- Identify areas of R &D where investment is needed to meet DOE mission requirements, and outline a roadmap for this research area of Exascale computing
- Help define and foster our technical community and its interactions with broader Exascale endeavors.
- Discuss the best ways of disseminating our methodologies, tools, and software

Expectations

- Participation, participation, participation
- Take the lead on various threads of interest
- Each of us is an important part of the community
– no “religious” debates
- State your ideas, only politely, we are not going to solve the technical issues today, just identify them and point to potential path forward.
- We are all here, let’s ensure optimal performance (with high energy efficiency and reliability...😊)

Workshop Agenda

Thursday, August 9th, 2012

- 08:00-08:15 a.m. Logistics, Workshop introduction Adolfo Hoisie
08:15-08:45 a.m. Exascale Initiatives and Projects, role of modeling and simulation William Harrod

Drivers for Modeling and Simulation Session

- 09:00-09:30 a.m. Architecture / Systems Sudhakar Yalamanchili
09:30-10:00 a.m. Applications / algorithms Jim Belak
10:00-10:30 a.m. Breakout Session

State-of-the-Art Session

- 10:30-11:00 a.m. Modeling Adolfo Hoisie
11:00-11:30 a.m. Simulation Arun Rodrigues
11:30-12:00 p.m. Emulation, Testbeds, V&V, proxy, apps, system access Jeff Vetter

12:00-01:00 p.m. Working Lunch: Industry Panel Shekhar Borkar, Jim Sexton, Dean Klein, Mike Parker, Steve Reinhardt, Doe-Hyun Yoon

Gaps, New Directions, Priorities and Investment discussions

- 01:00-03:00 p.m. Discussions of gaps in the M&S R&D Agenda

Parallel Sessions, Preliminary Topics:

- Modeling and Simulation for Exascale application development and optimization. Moderator: Bob Lucas
- Modeling and Simulation for Architecture Exploration. Moderator: Darren Kerbyson
- Modeling for intelligent runtime systems, system software. Moderator: John Shalf

- 03:00-03:30 p.m. Breakout Session
03:30-04:30 a.m. Plenary: Discussions of Priorities, New directions
04:30-05:00 a.m. Plenary: Recap / Goals / Homework for next day

Friday, August 10th, 2012

07:00-08:30 a.m. Recap of goals, brief summary of first day and homework

Gaps, New Directions, Priorities and Investment Continued

08:30-10:00 a.m. Refinement of priorities, new directions, etc.

10:00-10:30 a.m. Breakout Session

10:30-11:30 a.m. Prepare research plan (scale, roadmap, timeline)

11:30-12:00 p.m. Action Items, Wrap up