

Modeling and Simulations Uses and Needs

Modsim 2015

Ian Karlin

August 13, 2015



Are you actively using modeling and simulation (for performance/power/reliability) in your application work?

- Modeling usage:
 - Simple models for performance
 - Measurement to understand how performance tuning impacts power
 - Not used for reliability
 - To understand the impact of overheads of parallel synchronization constructs on codes
- No direct simulation usage in application development
 - Indirectly simulation informs application development through procurements and co-design

What are the needs in terms of modeling and simulation methodologies and tools from the modsim community?

- Where better modeling is usually needed:
 - Cut down options when there are many
 - Often application or problem specific
 - Best when difference between best option and good option is large
 - Very useful when best option for a different machines is different
 - Can be useful with auto-tuners
- When better modeling is usually not needed:
 - When there are only a few options
 - When the difference between good and good enough are similar
 - When the unknowns are greater than the model's resolution
- Simulation needs:
 - Most are met through vendor simulators via procurement
 - Where measurement perturbs data too much
 - In-band network counters
 - Fine-grain loop level details

How can modsim help in the development apps for new architectures, for optimization, and point design studies?

- Modeling:

- For complex problems models can help optimize current codes for current machines
- Can provide vendors with data about runtime overhead needs
- However, impact is likely limited to certain problems and domains

- Simulation:

- Has the ability to effect procurements if tools are picked up and used by vendors
- The same goes for Co-Design studies
- Otherwise use cases will be limited to where both modeling and measurement fail



**Lawrence Livermore
National Laboratory**