NNSA Use Cases for ModSim Tools

Workshop on Modeling & Simulation of Systems and Applications

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NNSA Use Cases for ModSim Tools

1. Provide guidance for procurement decisions
2. Hardware/software co-design
3. Application code analysis and optimization
4. Steering for advanced runtimes

ModSim for Machine Procurement

- Modeling is used heavily in procurements.

However,

- GEM5 and similar heavyweight tools have little or no use.
- Practically all models are pencil and paper
- Machine parameters are highly uncertain
- CORAL provided some small kernels for cycle accurate modeling, but no vendors used them.

ModSim for Co-Design

- Various simulation tools are in heavy use by vendors in hardware software co-design.

However,

- Mostly vendor specific internal tools
- Impact on production line (as opposed to research line) is unclear
- Different co-design questions require different models. Difficult to develop all needed models.

ModSim for Application Developer

- Application developers rely on models for performance decisions

However,

- Pencil and paper models are nearly universal
- **Measurements** are much more important than simulations in application optimization
- Input decks matter. Compilers matter. How will ModSim tools account for these variables?
- Most likely use cases: Network simulation, Task-based programming models

ModSim for Runtimes

- Difficult to see how simulation performance will be adequate to deliver actionable data to runtime
- Measurements probably more important

Summary

- Overall, skepticism regarding impact of heavyweight tools.
- Short-horizon modeling is useful and relevant. Long-horizon modeling is too uncertain.
- Performance measurement is very important. ModSim infrastructure and APIs might be useful in measurement tools.
- Need ways to create models from measurements.
- Open mind attitude, but success stories would help. Vendors are most likely points of engagement.

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