

Theme 3

STRATEGY

- Analogous to a satellite mission in terms of scale, cost, “mission” organization, ambition
- Need dedicated facilities
- Need much more effective collaboration of large labs, university community and vendor/compiler communities
- Need increased investment in computational science, closely linked to the enterprise
- Need balance among all components, including computing, data management (0.1 zettabyte), analysis, and viz, with attention to innovative methods, e.g., data mining
- Million-core machine likely to be very different from today’s computers --> there should be some investment in alternative architectures for longer term
- Heterogeneous (e.g, scalar/vector) architectures may be reasonable, although the hardware cost may be higher and the programming model may be more difficult

Theme 3

HARDWARE

- **Time-to-Solution metric: 100-1000 sim-days/day is target for whatever resolution**
- **Capability to deliver qualitatively new solutions**
- **Should strive for global non-hydrostatic, cloud (or cloud system) resolving in atmosphere (with comparable resolution in the ocean), even if this is unattainable within next five years**
- **Incremental progress is needed to work toward that goal**
- **Flexible hardware to support research into much higher resolution**

Theme 3

SOFTWARE

- **As machines reach millions of cores (or sooner), may need new ways of expressing concurrency both for hardware elements and for model components (PGAS, frameworks, etc.)**
- **Learn from previous experience in transition from vector programming model to parallel programming model and leverage experience of rest of petascale community**

Theme 3

MODELS

- **CGCMs now running at 50 km delivering 1000 times faster than real time; 25 km models are within reach within a few years**
- **Don't know if resolving clouds will definitely lead to better climate predictions, so we need a demonstration project**