WRF Software

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Outline

• Version 3 software
  – Software improvements
  – New platforms & performance
  – Coupling infrastructure

• Looking Forward
  – New architectures (GPUs, Cell, etc.)
  – Successor model: MPAS
WRF Software Improvements

• New data structures in registry
  – Higher-dimensional Tracer arrays
  – Subgrid arrays

• Smaller memory footprint (v3.1.1)
  – Static per process memory 130MB → 30MB
  – Moving nest infrastructure conditionally compiled

• Enhanced testing, software management
New Platforms and V3 Performance

- Blue Gene/P
- Cray XT5
- In Development
  - Windows
  - Blue Waters
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![Graph showing WRF 'nature run' benchmark on Cray XT with 50TF, 150K Processors]
Accelerators

• Tools for GPU coding
  – Tomas Nipen (UBC visitor)
  – Evaluating automatic tools:
    PGI Accelerator Compilers
    F2C translator (M. Govette, NOAA)
  – See poster on Wednesday
• Chem-solver acceleration
  – GPU, Cell, and Multicore
  – J. Linford, A. Sandu (Va. Tech), M. Vachharajani (CU)
  – SC09 paper (accepted)

RADM2 Benchmark
http://www.mmm.ucar.edu/wrf/WG2/GPU
Coupling Infrastructure

- ESMF-3.1.0rp2 capable
  - WRF-LIS coupling (AFWA)
  - WRF-Hycom coupling (with RSMAS, NRL)
- Hurricane WRF coupler
  - Developed at NCEP for WRF-POM/-Hycom
  - Evaluating for community version
- MCEL (M. Bettencourt)
  - WRF-Hycom (several TC-related projects)
  - NORCOWE, BCCR (I. Barstad)
- MCT (Jacob and Larson)
  - CCSM and WRF (J. Wolfe)
MPAS Development

- **Software requirements:**
  - Community model
  - Global capability
  - Range of scales, applications
  - Massively threaded million-core architectures
    - latency hiding
    - load balancing
    - heterogenous systems
  - Noise-free grid refinement

- **Fundamentally unstructured**
  - Nominally icosahedral but with in-place unstructured refinement
  - Explicit cell/vertex/edge connectivity
  - Temporal refinement
  - Multi-level 3-D parallel decomposition, also unstructured

- **Status**
  - Small test codes: e.g., parallel shallow water on sphere
  - Many computing issues pending