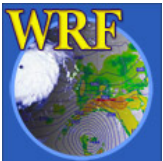


WRF Software

John Michalakes, Dave Gill
Michael Duda, Julie Schramm, Laurie Carson²

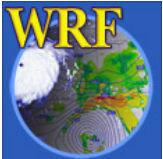
Mesoscale and Microscale Meteorology Division
National Center for Atmospheric Research

²Developmental Testbed Center



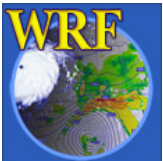
Outline

- Version 3 software
 - Software improvements
 - New platforms & performance
 - Coupling infrastructure
- Looking Forward
 - New architectures (GPUs, Cell, etc.)
 - Successor model: MPAS



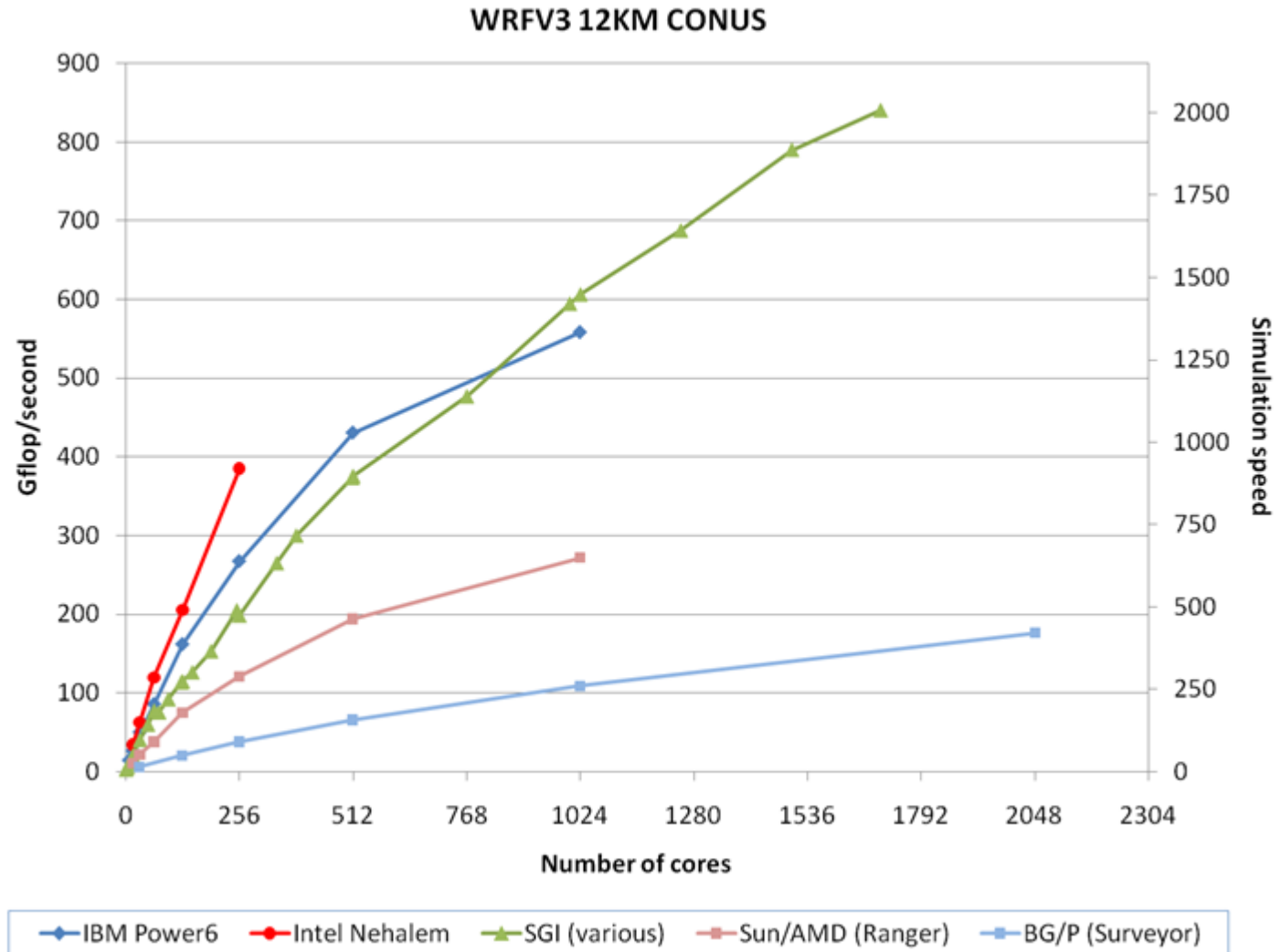
WRF Software Improvements

- 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



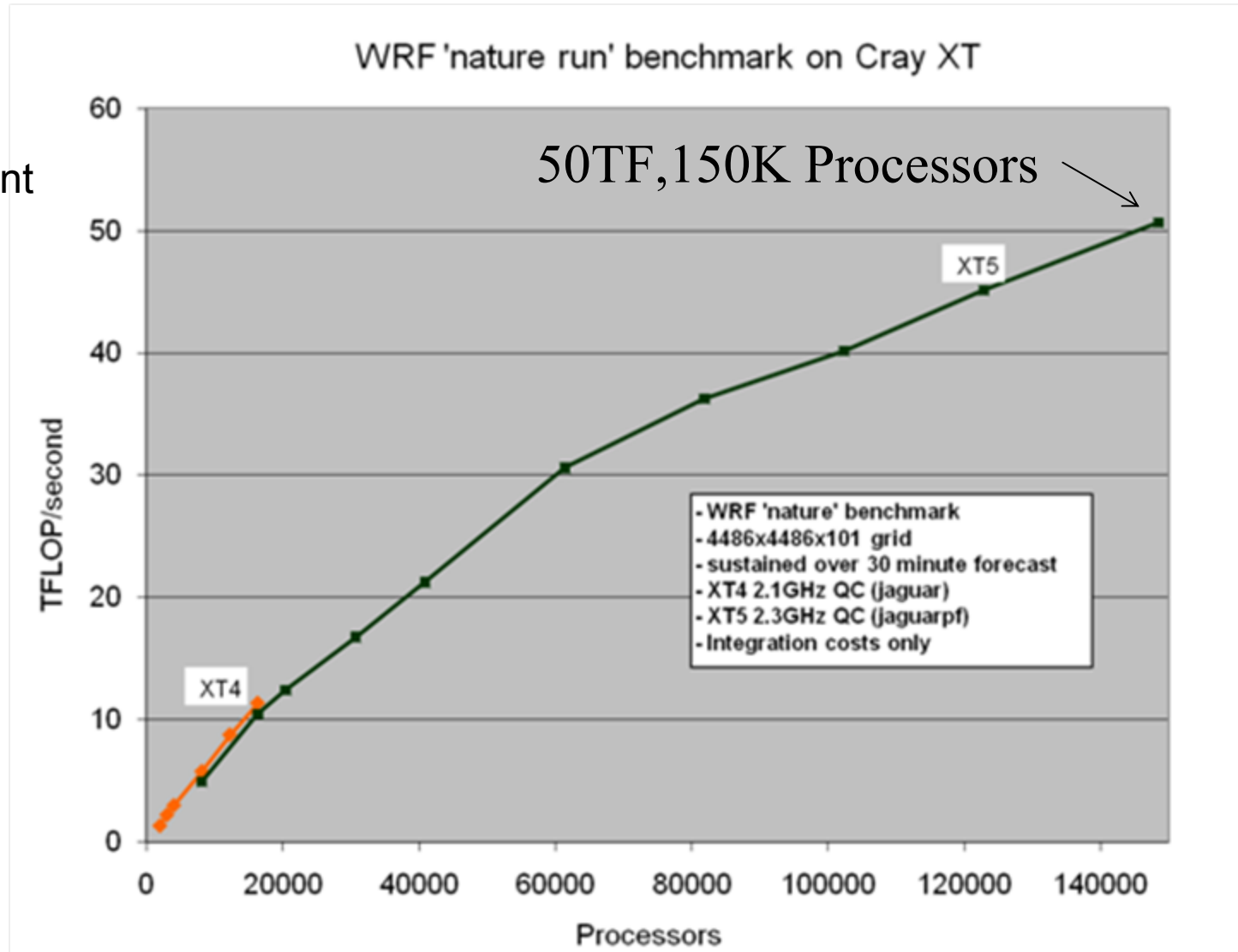
New Platforms and V3 Performance

- Blue Gene/P
- Cray XT5
- In Development
Windows
Blue Waters



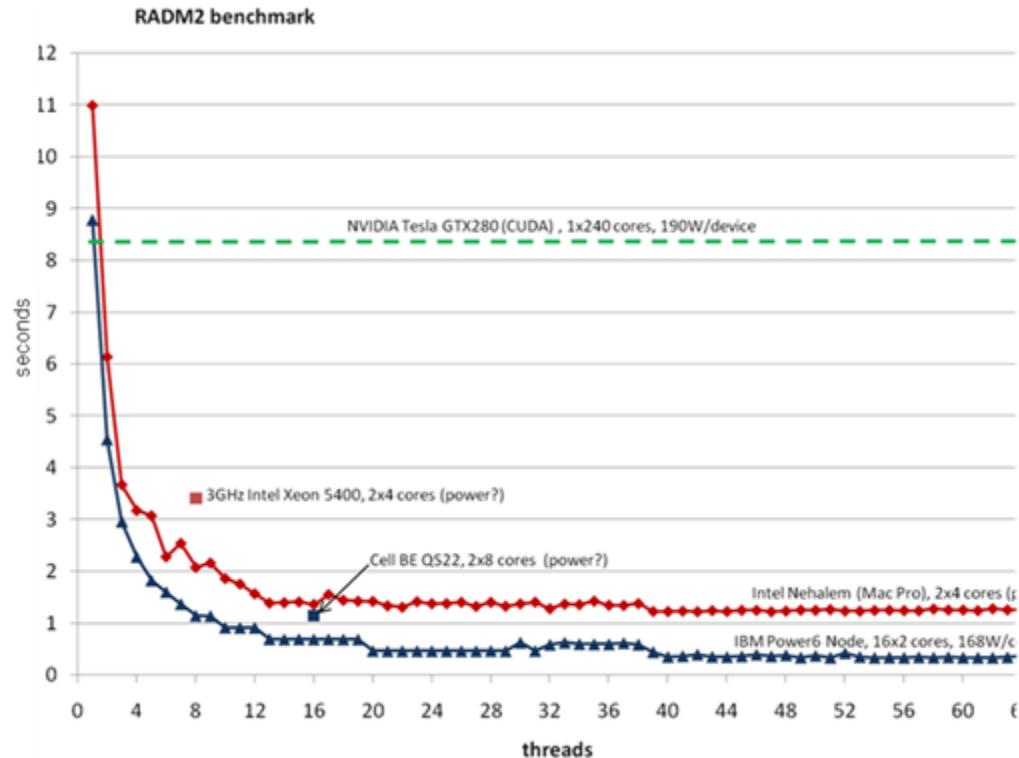
New Platforms and V3 Performance

- Blue Gene/P
- Cray XT5
- In Development
 - Windows
 - Blue Waters



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)

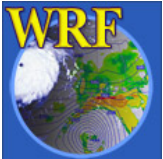


RADM2 Benchmark

<http://www.mmm.ucar.edu/wrf/WG2/GPU>

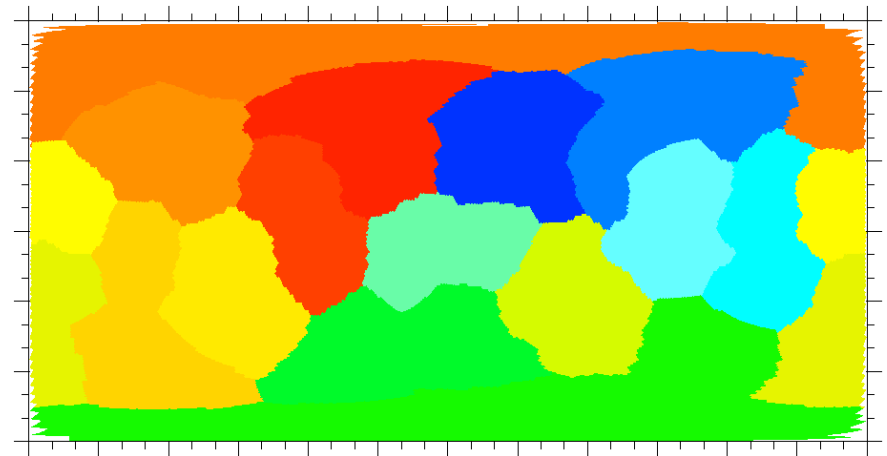
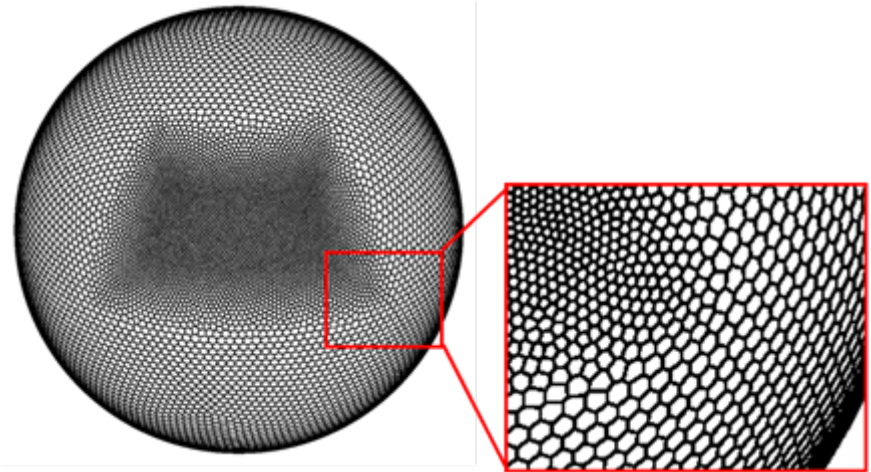
Coupling Infrastructure

- 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



Assignment of cells to 32 procs