NCEP Update

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NCEP/NCO/Systems Integration Branch

Unidata Policy Committee Meeting
Arlington, VA
May 12, 2009

“Where America’s Climate, Weather and Ocean Prediction Services Begin”
Overview

• NAWIPS/GEMPAK Transition to AWIPS-II

• CONDUIT
NAWIPS → AWIPS-II
Project Overview

• NCEP has ceased all development of its NAWIPS software system
  – Bug and emergency fixes being the exception
• Full NAWIPS system to be ported to AWIPS-II
• Software ready for Operational Testing and Evaluation by Q1FY11
• No changes to forecaster workflow
  – Some visual differences may be unavoidable
• Capitalize on new technology
Project Overview

• AWIPS-II represents a merging of two software systems - NAWIPS and AWIPS
  – Will allow for better collaboration between NCEP and NWS forecasters
  – Economic benefits as well.

• The combined system will contain components from AWIPS and NAWIPS
  – NMAP, NCEP Product Generation, GEMPAK, Data decoders/encoders, D2D, GFE, Hydro Apps, etc.
Project Overview

- N-AWIPS migration will leverage Raytheon baseline functionality wherever possible
  - Some functionality implemented directly
    - Animation, image manipulation
  - Some functionality enhanced
    - NCEP decoders, Grid diagnostics

- NCEP views this as a software and hardware consolidation

- No NCEP functionality is going away!
  - No forecaster workflow changes
Who NAWIPS Supports

• NCEP Central Operations (NCO) develops and maintains forecast application software systems called N-AWIPS

• NAWIPS Users:
  – NCEP Forecast Centers (~300 FTE plus contractors)
  – NCEP Central Computing System
  – NCEP Environmental Modeling Center
  – NESDIS Satellite Analysis Branch
  – NWS Alaska & Pacific Regions
  – NWS River Forecast Centers
  – NWS Central Pacific Hurricane Center
  – Unidata (~300 universities + private industry)
Schedule

Transition efforts are on schedule

- First Major Release to NCEP Centers and Unidata
  - April 1, 2009

- Additional releases to occur every six months
  - May increase to every three months after October 2009 release

- All NAWIPS applications to be ported by October 1, 2010
  - Operational Test & Evaluation to begin at that time
  - National Centers and Unidata involvement
FY09-FY10 Activities
NAWIPS Transition Activities

- NAWIPS software migration is broken into four major activities
  - Data Display capabilities (NMAP2, NTRANS, NSHARP, NWX)
  - Data decoders
  - Product generation
  - GEMPAK (legacy command line interface) – Local Apps
    - Working on a forward capability for this one
- Periodic incremental releases will allow for our customers to evaluate our progress
  - Full IV&V process
  - First release delivered on April 1, 2009
  - Future Releases every 3-6 months
- Version 1 of NAWIPS in AWIPS-II is targeted for October 2010.
  - Full OTE with NCEP customers planned
  - Delivery to NCEP customers via national baseline release
    - No longer a direct release from NCO
FY09 Activities
NAWIPS Transition

• Continue to work closely with the NWS AWIPS Program Office
• One-on-one TIMs with Raytheon have been extremely helpful
  – Validated NCEP’s approach to conversion
  – NCEP received commitment from RTS for incremental code delivery
  – RTS agreed to consider “Sample Code” from NCEP for inclusion into TO11 baseline
    • Allows for NCEP codes to be incorporated into national baseline ahead of Oct 2010 milestone
• **GEMPAK**
  – All current applications to be available in AWIPS-II era
  – Will no longer require GEMPAK file format – will still support it
• Forward compatibility – GEMPAK DM library access to AWIPS-II Database
• Provides a stop-gap capability for users migrating to AWIPS-II who run stand-alone GEMPAK applications
• Development starting now
  – SF-type db requests complete
  – SN-type db requests next
• Capability will become available with “GEMPAK 6.0” release
  – Expected with October 2009 release
• Still planning to move all GEMPAK applications into AWIPS-II
Unidata Involvement

- Monthly migration telcons
- IV&V, OT&E (baseline + NAWIPS extensions)
  - Test plans, cases and execution
- User training (limited) – web based
- Developers conference scheduled July 15-16 2009
- Design and development collaboration
- Liaison with University community
- **NCEP continues to view Unidata as a very important partner for NCEP’s total mission.**
Hardware Configuration

• Minimum configuration
  – EDEX (Data server) requires 2G RAM
  – CAVE (workstation) requires a video card that supports OPEN GL w/ 256M video RAM
    • NCEP tested – nVidia: GeForce 7600GT, GeForce FX 5200, Quadro FX 5500, Quadro FX 3450, Quadro Nvs 285
    • ATI: Radeon X1400 (untested)
  – Red Hat Enterprise 5.0

• Our experience
  – 4G RAM to run both
Training

• **Training Portals:**
  http://www.nwstc.noaa.gov/AWIPS/ADE/ADE_resources.html

• **Links to AWIPS Migration training and resources:**
  http://www.nwstc.noaa.gov/nwstrn/awips.htm
  – Includes new AWIPS2 SOA module

• **Suggested**
  – Java, Advanced Java (best practices)
  – Note that Java allows “wrapping” of C
    • Best implemented when performance is an issue
• CONDUIT - Cooperative Opportunity for NCEP Data Using IDD Technology

• Historical Perspective
  – USWRP sponsored project, initiated in 1997 timeframe
    • Was the highest priority of the USWRP/Science Steering Committee

• Link between NCEP and UNIDATA emphasized
  – Serve the University Community

• Importance to NCEP/Community recognized
  – Research done with operational models will ultimately help improve those models
  – NCEP set goal to become “First Choice” for the research community
CONDUIT

• Working towards providing real-time access to higher resolution gridded operational model data
  – NAM
  – GDAS
  – GFS
  – RUC
  – NAEFS
  – SREF

NAM 48h forecast of 500 mb heights, and absolute vorticity, valid 012500Z

Reproduced from Holton, 3rd Edit. Fig 10.19
Photo by Dave Fultz
CONDUIT

- CONDUIT currently fed by three load-balanced high-end servers
- Servers located at the edge of NOAA’s network at the NOAA Web Operations Center (WOC) (means quick access)
- Currently serve 42 GB of GRIB2 data per day to three top tier CONDUIT systems.
CONDUIT Inventory

Current Data Sets per Community Demands –

• GFS
  – 0.5 deg. – 00-180 hours
  – 1.0 deg. – 00-180 hours
  – 2.5 deg. – 192-384 hours

• NAM (All grids 00-84 hours)
  – 12 km CONUS (Surface fields only)
  – 40 km CONUS
  – 90 km CONUS
  – 45 km Alaska

SREF Probability of Precip > .25 inch/6hr
CONDUIT Inventory

- NAEFS (NCEP GFS Component)
  - Both NAEFS and TIGGE data sets for 21 members per cycle
- RUC – hourly time steps to FHR 12 (9)
  - 20 and 40 km Surface, Pressure, and Hybrid level files
  - 80 km Pressure files
## NCEP Atmospheric Models

<table>
<thead>
<tr>
<th>Model application</th>
<th>CFS Climate</th>
<th>GFS Global/Wx</th>
<th>GEFS/NAEFS Global Ensembles</th>
<th>NAM Regional/SevereWx</th>
<th>SREF Regional Ensembles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>T62 (~200km) 64 levels MOM3 1 deg 40 lev</td>
<td>T382 (~35km) to 7.5 days T190 (~70km) to 16 days 64 levels</td>
<td>T126 (~105km) 28 levels</td>
<td>12 km 60 levels</td>
<td>32-45 km/28-60 lvls</td>
</tr>
<tr>
<td>Forecast length</td>
<td>9 months 4/day</td>
<td>16 days 4/day</td>
<td>16 days 4/day</td>
<td>84 hrs 4/day</td>
<td>87 hrs 4/day</td>
</tr>
<tr>
<td># of Members</td>
<td>120/month</td>
<td>N/A</td>
<td>84/day</td>
<td>N/A</td>
<td>84/day</td>
</tr>
</tbody>
</table>
# NCEP Atmospheric Models

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<tbody>
<tr>
<td>Domain</td>
<td>CONUS</td>
<td>CONUS [CONUS &amp; Alaska]</td>
<td>2/3 CONUS Alaska Hawaii &amp; PR</td>
<td>Selectable 4-8 State [1-3 state]</td>
<td>Storm Movable nest</td>
</tr>
<tr>
<td>Resolution</td>
<td>13 km 50 levels</td>
<td>CMAQ 12 km / 22 levels [HYSPLIT off the 12 km NAM]</td>
<td>WRF-NMM 4.0 km 35 lvls WRF-ARW 5.1 km 35 lvls</td>
<td>NMM [HYSPLIT] 8 [4] km 50 lvls</td>
<td>HWRF &amp; GFDL 9 km 42 levels</td>
</tr>
<tr>
<td>Forecast length</td>
<td>12 hours 24 / day</td>
<td>12-48 hours 2 / day 4/day</td>
<td>48 hours 1 large nest + 1 small nest 4/day when no hurricanes</td>
<td>48 [30] hrs 4/day</td>
<td>120 hrs 4 storms 4/day</td>
</tr>
</tbody>
</table>
FY09 Model Implementations

- GFS Upgrade – physics changes and downscaled GFS output for NDFD, NDFD Guam grid
- GEFS Upgrade - resolution increase to T190, stochastic forcing, concurrent generation
- SREF Upgrade - resolution increase to 32 km, 10 WRF members, increased physics diversity, improved BUFR output
- RUC – extend to 18 hrs
- RTMA – Guam
CONDUIT Issues

• Lack of Feedback/Participation from data users
  – CONDUIT users meetings not well attended by users
  – Is this still the preferred method for the University and Research community to access NCEP data?
• Has content gone stale? – No longer cutting edge grid sets?
• Do users realize they can submit new requirements to Unidata for CONDUIT?
Questions?

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