

# Report on HRRR NOAA implementations – Computing resource status on NCEP operational computer, NOAA R&D Site A (Boulder, CO) and NOAA R&D Site B (Fairmont, WV)

For FAA AWRP audience.

13 July 2012 – initial draft version

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**NOTE:** This report describes current status as of this date but modifications are expected as the situation evolves.

**1. Background:** There are at least three related efforts to improve the reliability of the High-Resolution Rapid Refresh (HRRR) hourly updated 3km CONUS-domain model. These 3 efforts are related to

1. inclusion of HRRR-related requirements into the future NOAA operational-NCEP computer upgrades (a multi-year, moving-target effort but the ultimate solution),
2. hardening of the Boulder Jet facility and scripts and code itself to maximize the HRRR reliability on that single facility, and
3. development of a 2-computer solution using both NOAA R&D computers (Jet and Zeus) in the interim period to maximize HRRR availability in its experimental real-time status before full implementation of the HRRR on the NCEP operational computer.

This status is summarized in Fig. 1. Since the HRRR model is initialized from the latest version of the 13km Rapid Refresh (currently RAP version 2 or RAPv2), an independent cycle of the RAPv2 also runs on the NOAA R&D computers. Ultimately, an NCEP implementation of the HRRR will be initialized with the current operational version of the Rapid Refresh at NCEP at that point. So the needed resources in the R&D versions of the HRRR are for a combined 3-km HRRR run and an associated independent 13km RAP cycle. In contrast, no additional RAP cycle will be required for the NCEP *operational* HRRR.

## HRRR Transition to NCEP

- **Current – HRRR running on 1 supercomputer**
  - NOAA/ESRL – Boulder (JET)
  - Reliability: 97% (for outages > 3 h)
- **2012-14 – HRRR running on 2 supercomputers**
  - Boulder – computer 1 (JET)
  - Fairmont, WV – computer 2 (ZEUS)
  - Expected reliability 98-99% (for outages > 3h)
  - Planned NCO dissemination of HRRR grids
- **2015 – Operational HRRR implementation at NCEP**
  - Awaits NCEP computer upgrade, 99.9% reliability

Figure 1. Summary of HRRR transition steps toward operational implementation at NCEP. The 2015 date for that operational implementation is an estimate but not yet guaranteed. However, there is full commitment from NOAA and NCEP to operational implementation of the HRRR even if the date is not fully certain.

### 2. Current status as of early July 2012:

- HRRR is running for distribution for experimental real-time usage (for CoSPA, etc.) on the Boulder Jet computer system (Site A) *only*, as it has been since the inception of the HRRR real-time runs.
- Allowing for a gap of up to 3h (acceptable to CoSPA processing), the HRRR ran with an average 95.6% completion out to at least 12h for the June-October 2011 period. (Fig. 2).
- Zeus: An initial implementation of the HRRR and an accompanying experimental RAP cycle (code/scripts mimicking the Jet version) has been accomplished. Current reliability of the Zeus HRRR/RAP is about 85%, without any reservation yet provided on Zeus.

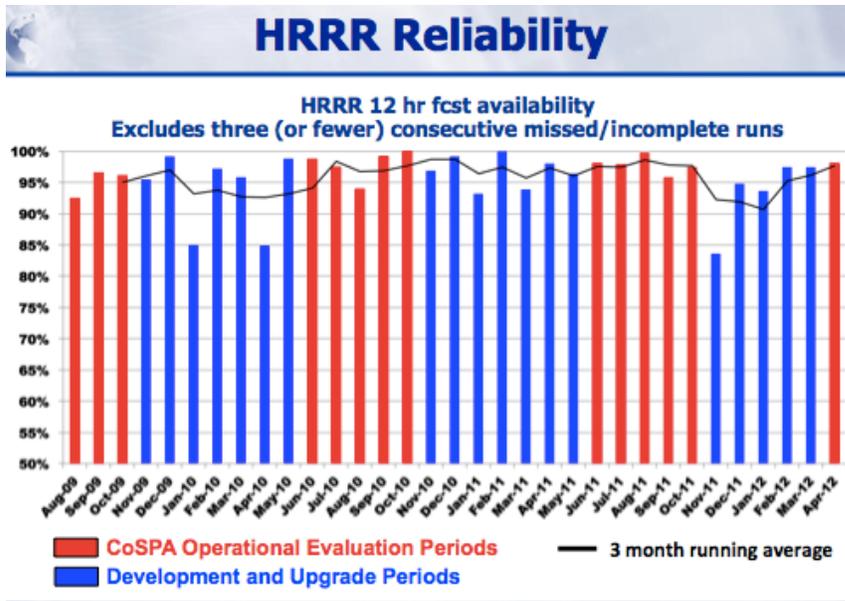


Figure 2, HRRR monthly reliability for August 2009 through April 2012. The red months are for those in which the experimental FAA CoSPA real-time exercises were being conducted. CoSPA (Convective Storm Prediction Algorithm) depends solely on HRRR grids for its 2-8h convective storm forecasts.

Zeus status continued:

- The configuration for the current Jet and Zeus configuration is described in Fig. 3 below. As noted, HRRR grids from neither jet or zeus are not yet ftp'd directly to NCEP. However, a distribution of experimental HRRR grids generated on the NOAA R&D computer(s) is planned by the NCEP Central Operations (NCEP/NCO) to improve HRRR availability and reliability.

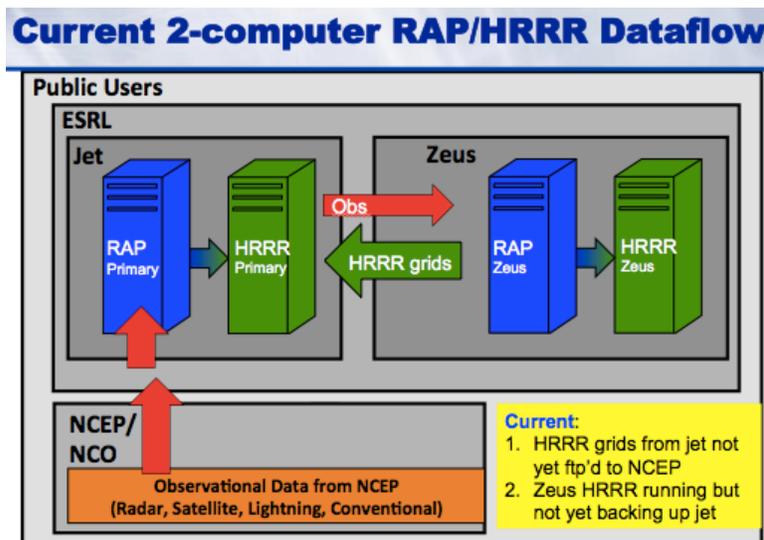


Figure 3. Current 2-computer RAP/HRRR data flow and configuration.

### 3. Plans for future:

- Step 1: An ftp of HRRR grids from Jet at ESRL in Boulder will be set up so that distribution of HRRR grids can occur directly from NCEP/NCO open to the public for any users. (Fig. 4)

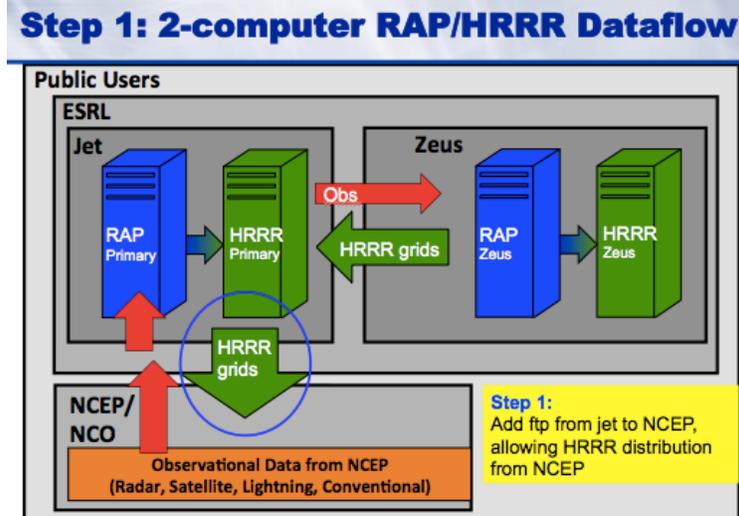


Figure 4. Planned addition of ftp of HRRR grids from jet in Boulder to NCEP to allow distribution of these grids from NCEP/NCO.

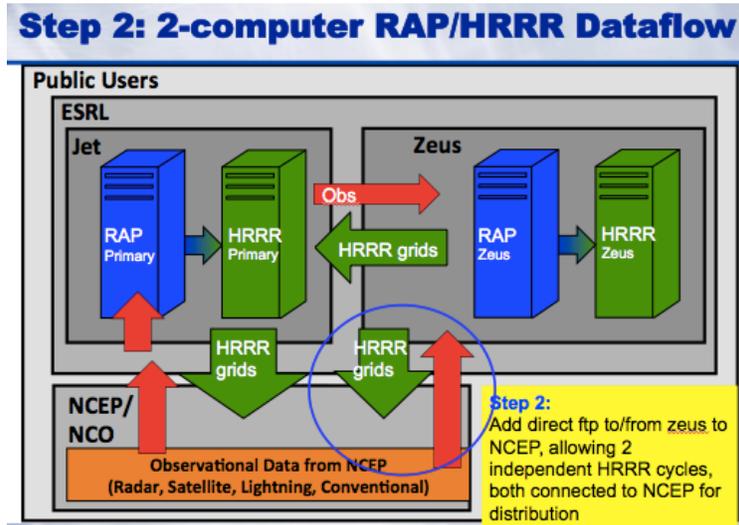


Figure 5. Second step to allow 2 independent HRRR solutions on the NOAA R&D computers to improve reliability.

- Step 2: With the addition of direct ftp connection between the zeus computer and NCEP/NCO (Fig. 5), this will provide 2 *computationally independent* solutions of the HRRR model (using the same code) in this interim solution prior to a full NCEP implementation of the HRRR. This change will avoid vulnerability of zeus HRRR runs to a jet outage and avoid data passing through jet for the zeus HRRR runs.

It is anticipated that the 2-computer solution of the HRRR can be enabled by no later than spring 2013 and perhaps by late 2012 (Fig. 1). This 2-computer redundancy will produce an estimated 98-99% reliability, much better than the current ~95% reliability on a single computer. To the extent possible, maintenance operations on Jet/Boulder and Zeus/Fairmont will be scheduled on separate days to minimize HRRR outages in this 2-computer period. The 2-computer solution will reduce outages from a current ~5% to approximately 1-2%.

The initial implementation of the HRRR at NCEP is best estimated to occur in 2015. The 2015 date for that operational implementation is an estimate but not yet guaranteed. However, there is full commitment from NOAA and NCEP to operational implementation of the HRRR even if the date is not fully certain.

This report will be updated as more information becomes available.