1. WSR-88D Software Build 10

1.1. Beta Test Started – March 11, 2008; Deployment Starts – May 5, 2008

1.2. Changing Level II Data Format from Message 1 to Message 31

1.2.1. Introduced at 1/18/2007 FOS briefing in San Antonio, TX

1.2.2. Announced in 3/2/2007 Public Information Statement

1.2.3. Enables future larger Level II data sets

1.2.3.1."Super Resolution" (Build 10) in "Split Cuts" (first 2 or 3 elevations)

1.2.3.1.1.1.Increase Azimuthal sampling from 1.0 to 0.5 degree

1.2.3.1.1.2.Increase Reflectivity range sampling from 1.0 to 0.25 km

1.2.3.1.1.3.Provide Doppler Velocity and Spectrum Width to 300 km

1.2.3.1.1.4.If included in Level 2, would increase throughput by 2.3X; Max 160Kbps/radar; Network Max 7.3Mbps

1.2.3.2.Dual Polarization (Build 11)

1.2.4. Needed for RDA to RPG data transfer

2. Message 31 Preparation Milestones

2.1. Interface Control Documents drafts were initially posted in March 2007 at: http://www.roc.noaa.gov/NWS_Level_2/BuildInfo/b10main.aspx

2.1.1. Current Versions are:

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2.1.1.1. 2620002 - Draft RDA/RPG ICD (08/21/07)
2.1.1.2. 2620010 - Draft Archive II/User (03/24/08)
2.1.1.3. 2620013 - Draft RPG Base Data Distribution Server
      (BDDS) Interface (03/06/2007)
2.1.1.4. 2620001 - Draft RPG/Class 1 User (07/23/2007)
2.1.1.5. 2620003 - Draft Product Specification (05/07/2007)
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2.2. Sample Archive Data set posted in June 2007 at: http://www.roc.noaa.gov/NWS_Level_2/BuildInfo/b10main.aspx

2.3. Sample Real-Time data available via LDM:

2.3.1. ROC Test bed radar (NOP3) August 2007 through March 2008.

2.3.2. Currently available from operational beta test sites: Super-Res (KPAH, KMPX), Recombined(KYUX), Legacy Resolution (KVWX)

2.4. Message 31 Level 2 base data (Site id NOP3, KPAH, KYUX, KMPX, KVWX) is available from NCDC at http://www.ncdc.noaa.gov/nexradinv/choosesite.jsp. Note: The new file name convention (see 7.1 below) started on March 17, 2008.

2.5. Beta Version of Build 10 CODE (includes RPG software source code) is available at: http://www.weather.gov/code88d/. Final version will be posted by May 5, 2008.

2.5.1. Includes software to read message 31 and the Recombination algorithm

2.6. First site added to the network as part of Beta Test in March 11, 2008.

3. Key RDA/RPG Super-Res Functionality

3.1. RPG can command RDA to disable/enable Super-Resolution for all VCPs

3.2. When super-res is enabled, the RPG performs "recombination" to provide legacy resolution data for existing algorithms and products.

3.2.1. Recombination lowers moment variance to meet system requirements

3.2.2. Doppler split cut radials contain range unfolded/flagged reflectivity data to 300km for Recombination Algorithm

3.3. Super-res data will generate new base products; No legacy products changed.

3.4. General Status Message reports which elevations cuts are generated at Super-Res
3.5. System Status Log which is archived via ASP product every 8hrs will report the Super-Res Generation Mode and LDM Level 2 data version number each volume
3.6. While the RPG is receiving a super-res cut the radar antenna graphic on the main HCI status window will contain "SR" right below the elevation angle. This is based on the spatial resolution of first radial in the cut (i.e., azimuth resolution is ½ deg or the surveillance bin size is 250m).
3.7. The RPG HCI Basedata window displays the highest resolution data available while in Scan Mode. Legacy resolution (recombined during super-res mode) is displayed in Selected Angle Mode..
3.8. Until NWS comms network can support the increased throughput, recombined message 31 data will be provided in the LDM stream; RPG adaptation data will determine if Level 2 data is recombined or super-resolution.
  3.8.1. As NOAAnet is implemented at NWS forecasts offices (WFO), the Level 2 LDM data stream will be switched to "Super-Res" for NWS WSR-88Ds.
  3.8.2. Level 2 LDM data from DOD and FAA WSR-88Ds will be remain at "Recombined" until radar-to-WFO comms is upgraded (date unknown).

4. Level 2 Data Format

4.1. Volume Coverage Pattern message in the Level 2 meta-data contains Super-Resolution Control specification for each elevation cut
4.2. RDA Status message contains Super-Res Status (Enabled/Disabled)
4.3. Message 31 will be used for every cut of every VCP, regardless of the Super-Res Generation Mode (enabled/disabled) or LDM Distribution Mode (Super-res/Recombination).
4.4. Message 31 radial data header block contains Azimuth Resolution Spacing to indicate radials are spaced every ½ degree or 1 degree in azimuth.
Message 31 radials includes Control Flags in the data block for each moment to indicate the data has been Recombined in azimuth and/or range.
4.5. Super-Res low elevation Doppler split-cuts include reflectivity data to support the RPG Recombination algorithm. Recombined base data will NOT include Refl. on low elev. Doppler Split Cuts
4.6. Message 31 supports additional data fields for Dual-Polarization in Build 11
4.7. Message 31 radar data messages are variable length
  4.7.1. Radials only contain sampled moments (e.g., Doppler moments not zero filled on Surveillance Split cuts)
  4.7.2. Truncated at 70Kft altitude
  4.7.3. Message 31 base data message are never segmented
4.8. All other messages are unchanged
  4.8.1. Segmented at 2432 bytes
  4.8.2. Zero filled exactly as before. For example: a) the block size of the meta data that precedes each volume scan is fixed to accommodate the largest possible message size of each message type; unused segments are zero-filled and are denoted by a message type value of 0, and b) RDA Status messages embedded within the radial data messages are not zero filled.

5. **Types of base data**
   - 5.1. Message 31: Legacy resolution(Evansville KVWX)
   - 5.2. Message 31: Legacy resolution (Super-Res Generation disabled)
   - 5.3. Message 31: Super-Resolution
   - 5.4. Message 31: Recombined Super-Res

6. **Real-Time delivery of Level 2 data via LDM**
   - 6.1. Radials will be packaged and compressed in bundles of 120 radials (3 or 6 per elevation cut)
   - 6.2. Number of LDM message per volume scan will normally range from 22 to 85.
   - 6.3. Single site average throughput currently at 5-70Kbps will increase to 11-160Kbps
   - 6.4. Total network hourly average throughput currently at 0.5-3.2Mbps will increase to 1.2-7.3Mbps
   - 6.5. The version number in the 24byte Archive II header will change (i.e. AR2V00xx, where xx will identify the type of base data and radial data message). This header is in the first data block of the Level II data, and is not compressed.
     - 6.5.1.1. Version 01: Message 31: Evansville (KVWX)
     - 6.5.1.2. Version 02: Message 31: Legacy resolution (Super-Res Generation disabled)
     - 6.5.1.3. Version 03: Message 31: Super-Resolution
     - 6.5.1.4. Version 04: Message 31: Recombined Super-Res
   - 6.6. LDM key (i.e., L2-BZIP2/NOP3/20070816153631/7/35/E) will change to also identify types of base data (legacy-res, super-res, recombined) and radial data message (1, 31), and other characteristics (spare for future use)
     - 6.6.1. L2-BZIP2/NOP3/20070816153631/7/35/y/Vxx/0
       - 6.6.1.1. Where y is E(end of volume), S (volume start), or I(intermediate)
       - 6.6.1.2. xx is version number
       - 6.6.1.3. The zero at the end is the spare for future use
     - 6.6.2. Example
       - `6.6.2.1. L2-BZIP2/NOP3/20070906124535/247/69/I/V03/0`
       - `6.6.2.2. L2-BZIP2/NOP3/20070906124535/247/70/E/V03/0`
       - `6.6.2.3. L2-BZIP2/NOP3/20070906125006/248/1/S/V03/0`
       - `6.6.2.4. L2-BZIP2/NOP3/20070906125006/248/2/I/V03/0`

7. **Level 2 Data from NCDC.** File names in the NCDC archives will change for Build 10 data (currently, KTLX20070530_085256) to report the data version number (xx) and gzip compression as follows:
   - 7.1.1. 6500KMPX20080401_202558_V04.gz
   - 7.1.2. 6500KMPX20080401_203538_V02.gz
   - 7.1.3. 6500KMPX20080401_205456_V03.gz
   - 7.1.4. 6500KVWX20080416_155619_V01.gz

8. **Key Super-Res Functionality using RPG Clones**. The RPG Common Operations and Development Environment (CODE) at http://www.weather.gov/code88d/ can be used to process level 2 data via live LDM stream or playback using NCDC archive

data. This may be referred to as an RPG Clone to distinguish it from the operational WSR-88D RPG.

8.1. The Super-Res Generation Modes reported in the Status Log is based on RDA VCP data contained in the level 2 metadata, so the status log will report SR if the RPG clone is processing recombined or super-res data.

8.2. The General Status Message is also based on the RDA VCP message and therefore will indicate super-res while processing recombined data.

8.3. The Super-Res Ingest Status reported on the Main HCI radar antenna graphic is based on spatial resolution contain in the first radial of the cut, therefore SR will only appear when processing super-res cuts and not when processing recombined or legacy resolution cuts.

8.4. Super-Res product generation also depends on the spatial resolution in the basedata header and therefore will not be generated using recombined data.

8.5. The RPG HCI Basedata displays the super-res data stream or the normal data stream. The highest resolution available is contained in the super-res data stream and displayed in Scan Mode, and Selected elevation cut mode displays legacy resolution which is contained in the normal data stream.

8.6. CODE includes the tools read_ldm and play_a2 to ingest level 2 data from the live LDM stream, or from archive data received from NCDC, respectively. These tools will ingest level 2 metadata and therefore, clone functionality with respect to super-res should be nearly identical to RPG baseline functionality.

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