

NCDC the “One Stop Shop” for all WSR-88D Level II Data Services

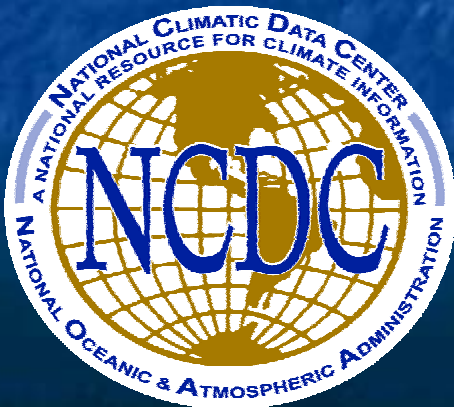
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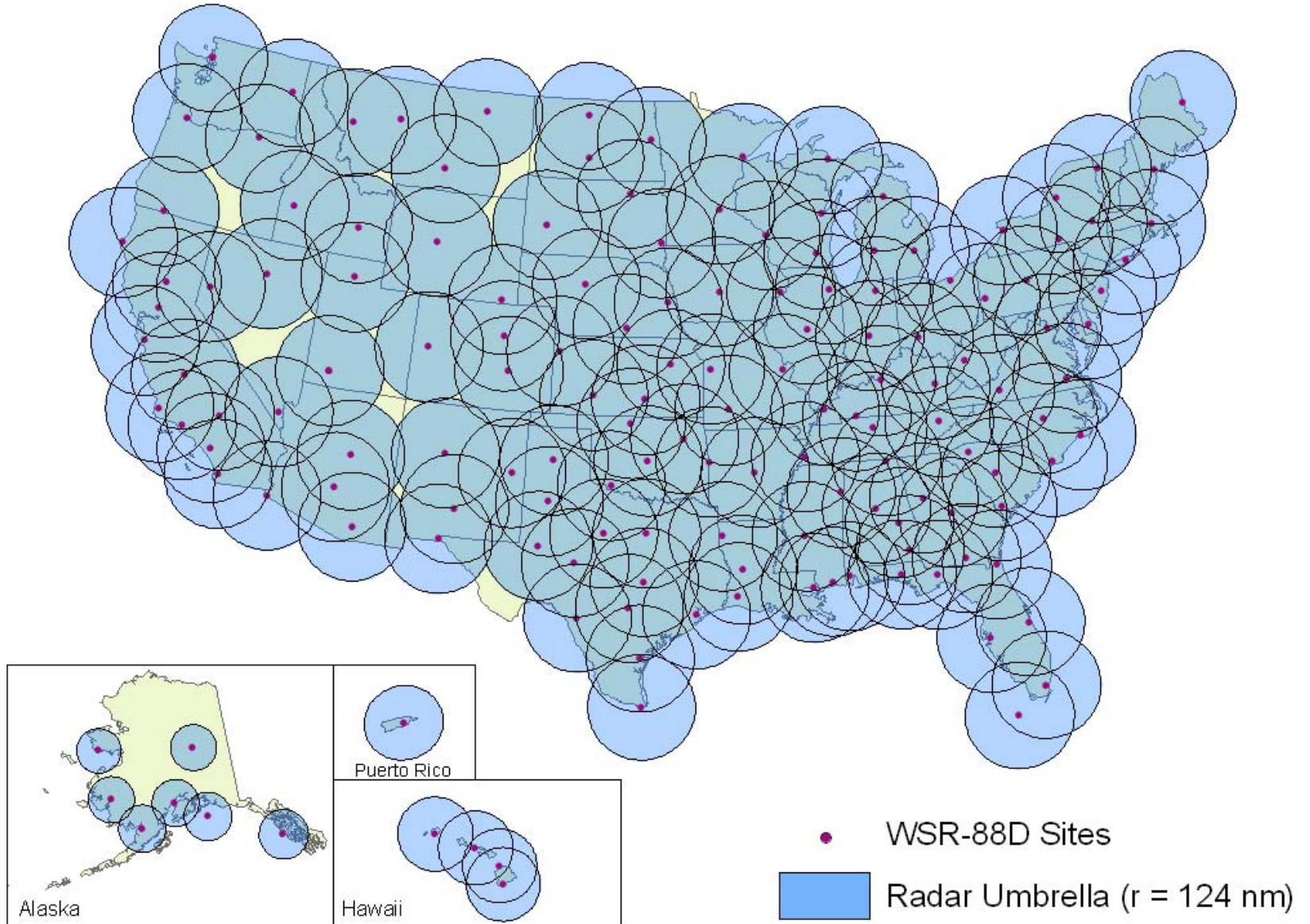


History

- **NCDC receives WSR-88D level II (base) data from 120 NWS, 12 FAA and 26 DOD sites ([Figure 1](#)) on 8mm tape or online (pilot)**
- **The NCDC Mass Storage System warehouses 900 terabytes of Level II data and grows annually at a rate of 60 terabytes a year (120 terabytes with offsite backup)**
- **Prior to August 2000 level II data was archived on 8mm tape**
- **These data have been migrated to the NCDC Mass Storage System (77K tapes)**

Figure 1

Current NEXRAD WSR-88D Radar Sites

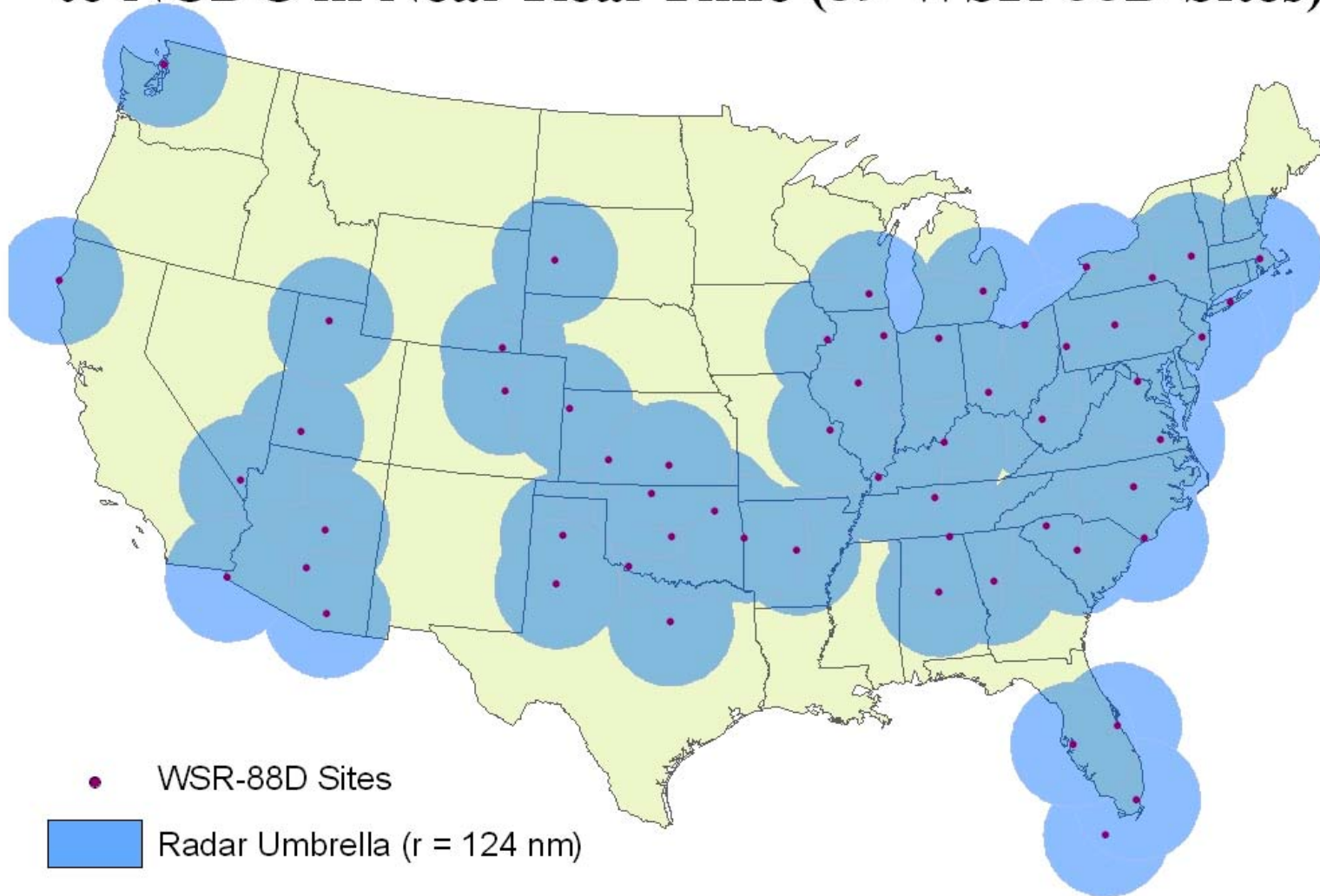


NEXRAD DATA SERVICES

- **Access to level II data from sites sending 8mm tapes to NCDC are not readily available to the user community until several weeks after an event.**
- **The capture rate, using 8mm tape, to record level II data at the radar site for the entire NEXRAD network is approximately 65%.**
- **Sites ([Figure 2](#)) that electronically transmit level II data to NCDC have capture rates at over 95% and data are available in near real time.**
- **To date, the stability of electronic transmission has led to suspending recording on 8mm tapes at 59 radar sites.**

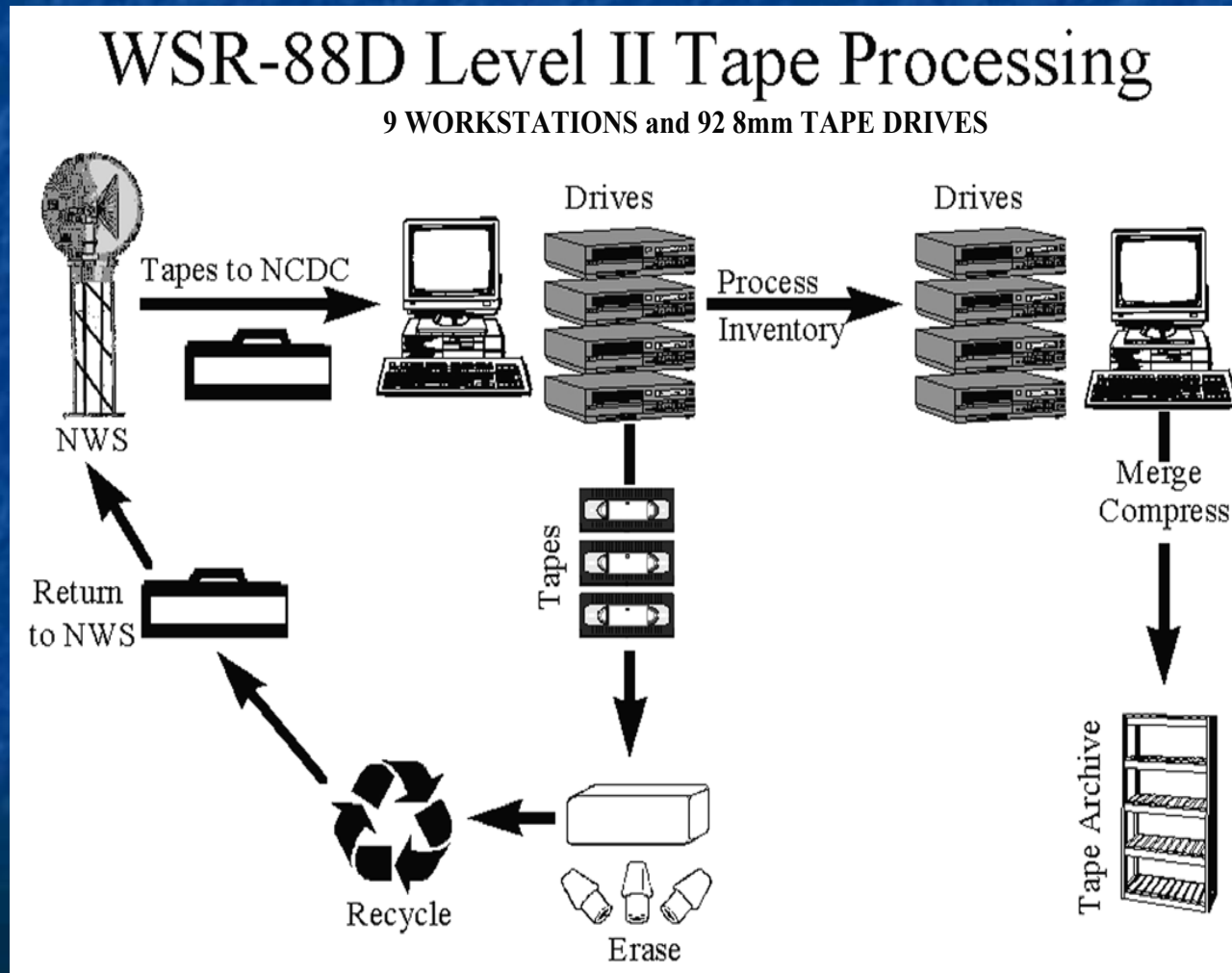
Figure 2

Current NEXRAD Sites Delivering Level II Data to NCDC in Near Real Time (59 WSR-88D Sites)



Improvements to Operations

- Until recently, the acquisition, archive, and dissemination of level II data required several interactive steps



Improvements to Operations

- **With all radar data residing on the NCDC mass storage system dissemination of level II radar data have been substantially improved.**
- **For example, currently retrieval time for 20 GB of level II data takes ~ 30 minutes; however, if copied from tape it requires 58 customer tapes and 9 work stations each running 26 hours for a total of 234 hours.**
- **Other benefits for using the NCDC mass storage system to archive level II data include:**
 - 1. Level II base data reside on the standard NCDC archive media**
 - 2. Provides 12:1 compression ratio and tar capabilities**
 - 3. Reduces costs of tape drives & maintenance by eliminating tape sorting and merging**
 - 4. Provides more efficient and less expensive access to the data**
 - 5. Enhance quality control process by automating several interactive steps**

Web Based Services

- NCDC radar resources web page provides direct access to WSR-88D level II digital data, at no cost, via FTP without contacting a NCDC customer service representative.
- To browse NEXRAD data inventories the user goes to <http://has.ncdc.noaa.gov>, selects the level II option, and follows the instructions for dataset retrieval.

The screenshot shows a web form titled "NEXRAD Level II". It contains a list of radar stations with their operational dates, date selection fields for start and end dates, an output format dropdown, and an email address field.

| Station(s) | Start Date: (YYYY/MM/DD) | End Date: (YYYY/MM/DD) | Output |
|--------------------------------|--------------------------|------------------------|--------|
| KABR (06/16/1995 - 08/26/2002) | 1991 / 01 / 01 | 2002 / 01 / 01 | FTP |
| KABX (05/18/1995 - 09/11/2002) | | | |
| KAKQ (07/13/1995 - 09/18/2002) | | | |
| KAMA (03/17/1994 - 09/18/2002) | | | |
| KAMX (09/27/1993 - 09/18/2002) | | | |
| KAPX (07/31/1996 - 09/03/2002) | | | |
| KARX (07/08/1996 - 09/10/2002) | | | |
| KATX (04/26/1995 - 09/18/2002) | | | |
| KBBX (10/22/1996 - 12/03/2000) | | | |
| KBGM (09/01/1995 - 09/18/2002) | | | |

Email Address:

Continue With Selections Reset Form

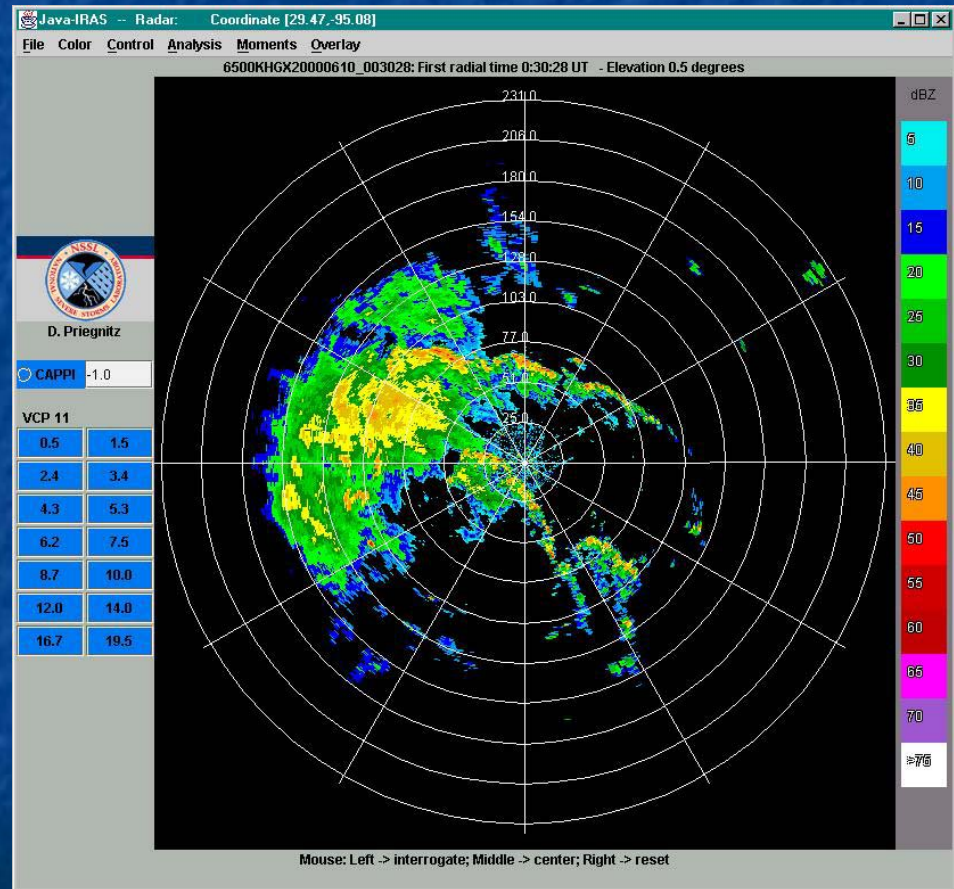
Web Based Services

- **The NCDC collaborated with the National Severe Storms Laboratory to modify the Interactive Radar Analysis Software (IRAS) visualization software**
- **IRAS is a platform independent software application and is available for download at URL:**
<http://www.ncdc.noaa.gov/oa/radar/iras.html>
- **Integrating IRAS to be used as a web-based browser. Users will be able to peruse the inventories and visualize the three types of radar moments (reflectivity, spectrum width, velocity) prior to ordering**

Web Based Services

➤ Java-IRAS functions include:

- * Plan Position Indicator, displays elevation cuts
- * Constant Altitude PPI, displays heights
- * Range Height Indicator displays azimuths
- * Auto-update of selected or all elevation cuts
- * Basic looping of PPI or CAPPI
- * High resolution map overlays
- * Standard WSR-88D color tables
- * Zoom and re-center capability for PPI and CAPPI displays



Potential Growth NCDC Radar Archives

- **Deployment of the WSR-88D Open Radar Product Generator (ORPG) and the Open Radar Data Acquisition (ORDA) module provides WSR-88D computational capabilities for developing higher resolution data, new products, and new data streams**
- **Increasing numbers of users are requesting level II data in near real time as well as retrospectively for research and development, verification, training, and other uses.**
- **The NWS is developing plans for collecting and distributing Level II data to NCDC and other users in near real time.**
- **NCDC data ingest and archive requirements will be significantly impacted over the next several years.**

Potential Growth NCDC Radar Archives

- **Implementation of new radar technologies, such as dual polarization may increase the growth of the radar digital archive by a factor of 26 ([Figure 3](#))**
- **Annual data receipt of 60 terabytes may, in ~ seven years, increase 1,600 terabytes per year or 3,200 terabytes with backup (Chart A, Courtesy Tim Crum Radar Operations Ctr)**

Figure 3

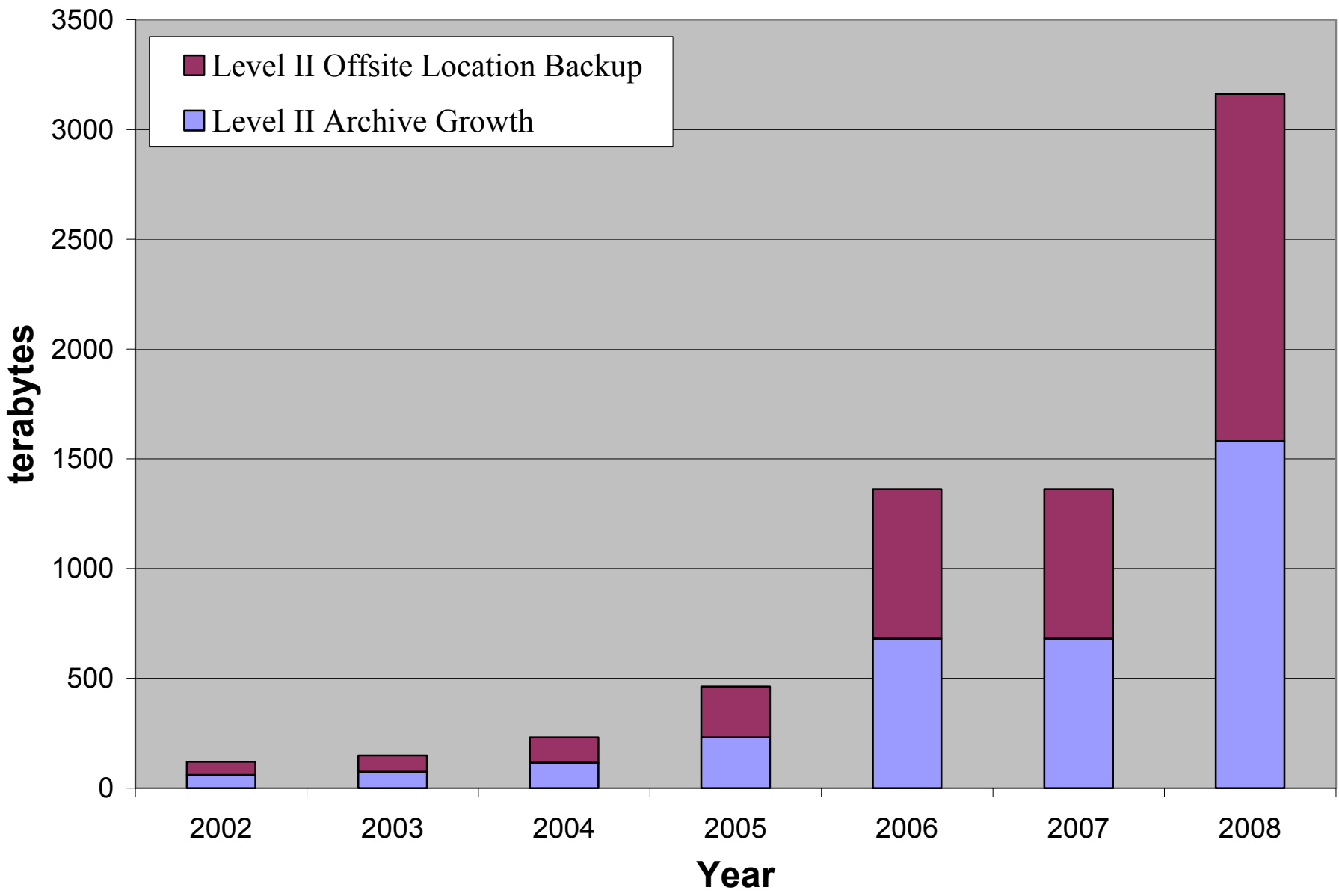


Chart A

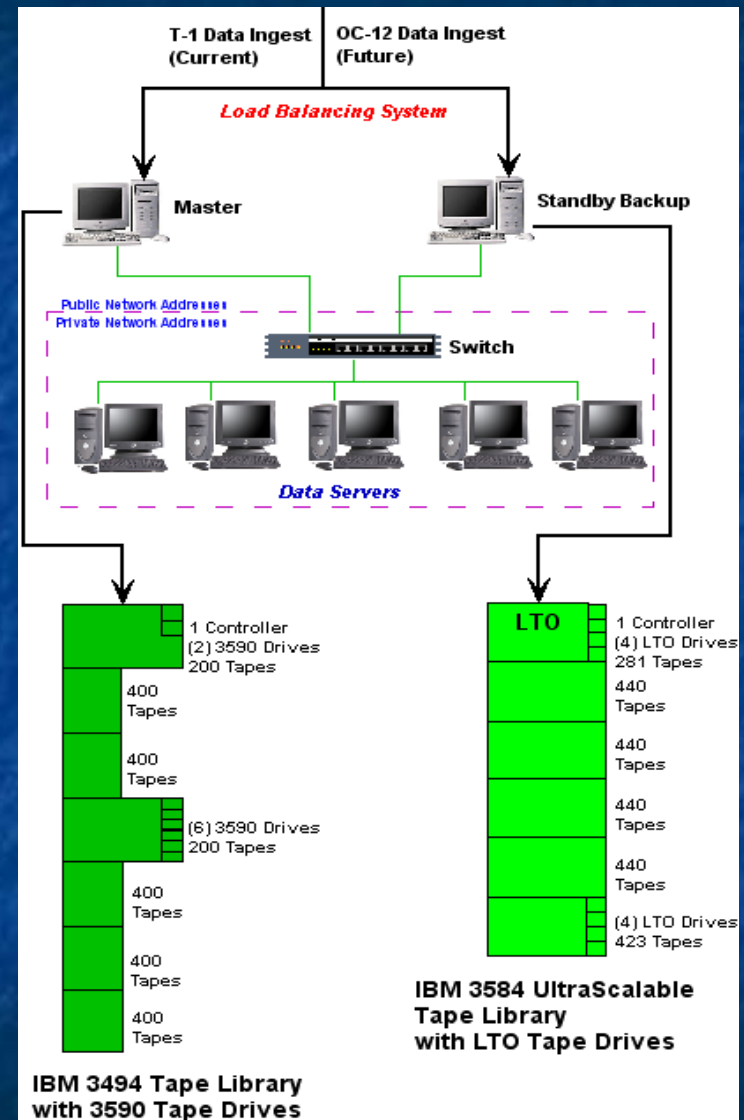
| New Data Requirement | Data Flow Increase Multiple Factor | Target Implement Date (Q/YY) | Data Flow Cumulative Multiple Factor |
|--|------------------------------------|------------------------------|--------------------------------------|
| 4.1 Minute Volume Coverage Pattern | 1.24 | 4/03 | 1.24 |
| 250 m, vice 1 km, Reflectivity Data | 1.56 | 4/04 | 1.93 |
| 0.5 °, vice 1.0 ° Azimuthal Sampling | 2.00 | 1/05 | 3.86 |
| Doppler Data To End Of 2 nd Trip | 1.49 | 4/05 | 5.76 |
| Two Different Clutter Filters & SNR Thresholds | 1.97 | 1/05 | 11.35 |
| Dual Polarization, 4 New Moments | 2.32 | 1/08 | 26.35 |

Potential Growth NCDC Radar Archives

- Ingest and archive processing for sites transmitting data electronically use Unidata Local Data Manager software to move the data from the sites via the internet (NGI) directly to the NCDC mass storage system.
- The current mass storage system has an archiving capacity of 1920 terabytes, 384 terabytes per cabinet @ new cabinets can be added
- However, the current architecture will not be able to keep up with the potential radar data growth at a magnitude of twenty six fold.

Potential Growth NCDC Radar Archives

- Future plans call for upgrading the communications line from a T-1 (1.54 megabits per second) to a OC-12 (622 megabits per second) and the current tape library to an ultra scaleable system that has much higher tape storage capacities.
- Figure right shows the current electronic ingest to archive process (left), future architecture (right) and projected tape storage capacities.



Projected Tape Storage Capacities (GB)

| CY | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-----------|------|------|------|------|------|------|------|------|------|------|------|
| 3590 tape | 40 | 40 | 80 | 80 | 200 | 200 | 200 | 400 | 400 | 800 | 800 |
| LTO tape | 100 | 100 | 200 | 200 | 400 | 400 | 800 | 800 | 800 | 1600 | 1600 |

Data Mining Services

- There is great potential for mining WSR-88D level II data.
- Each WSR-88D tilt sequence produces millions of data points consisting of three variables distributed over a large volume.
- Mining tools will be used to browse the NCDC, level II radar data archives in an effort to reveal, analyze, and extract unique unknown continuous parameters in the data that may lead to the identification of specific weather events or phenomena.
- NCDC is partnering with the National Severe Storms Lab, University of Oklahoma and University of Alabama, Huntsville to develop and implement data mining tools.

Partners

- NOAA National Climatic Data Center
- NOAA National Weather Service
- Radar Operations Center (NWS, FAA, DOD)
- NOAA National Severe Storms Laboratory
- Unidata
- University of Oklahoma
- University of Alabama, Huntsville
- MIT, Lincoln Laboratory



Space Shuttle Columbia Debris Plume

Figures 1, 2 & 3 depict debris patterns from the Space Shuttle Columbia tragedy caught on NWS Doppler radar, Shreveport LA. The debris plume covers an area of approximately 177 miles and was detected during clear air conditions over East Texas & West Louisiana.

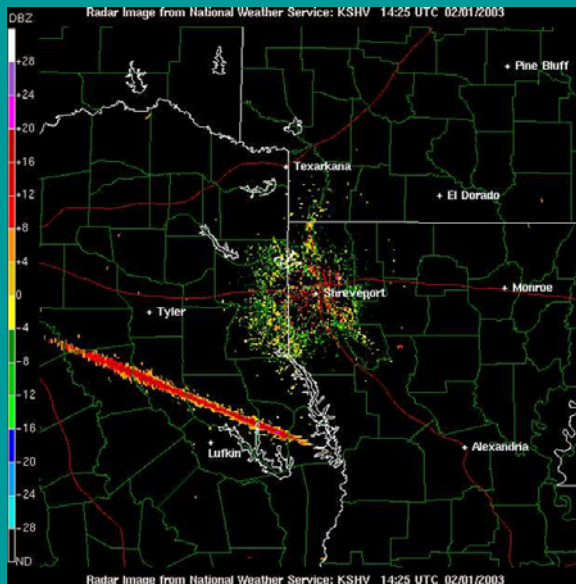


Figure 1. Base Reflectivity Radar image for 02/01/03 8:25AM CST

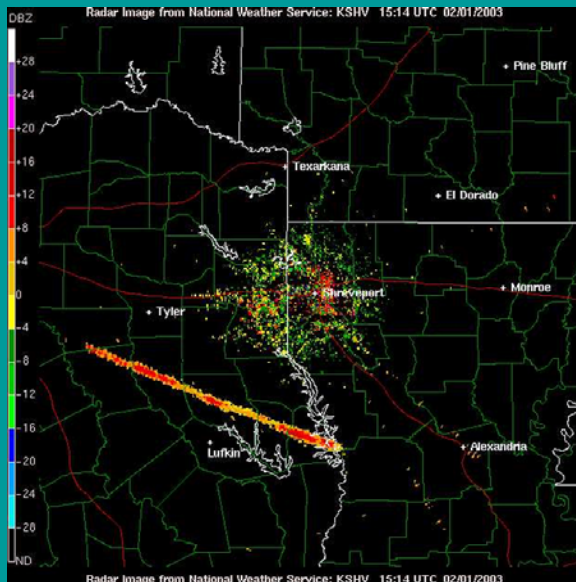


Figure 2. Base Reflectivity Radar image for 02/01/03 9:14AM CST

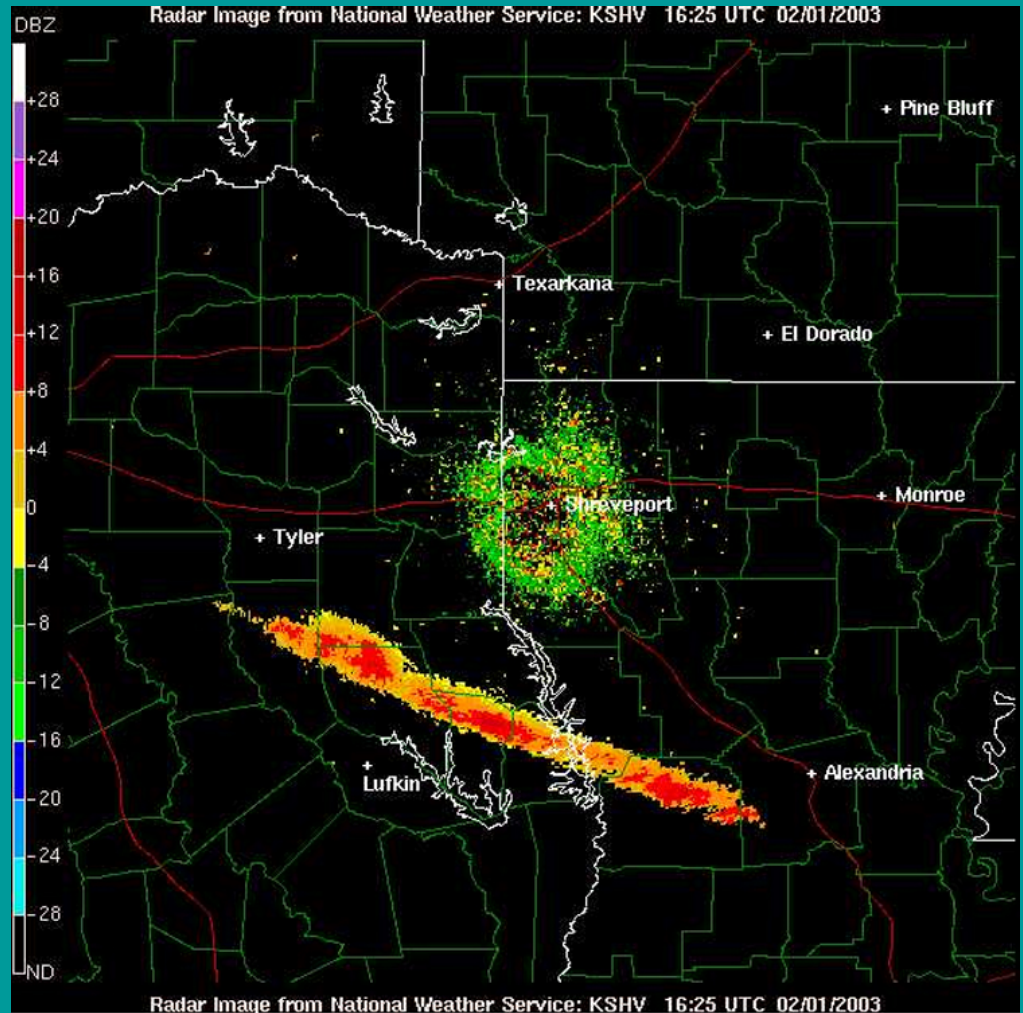


Figure 3. Base Reflectivity Radar image for 02/01/03 10:25AM CST