

Additional Questions NOAA's National Weather Service (NWS) Has Received
 Since the July 25, 2003 Posting of Questions Based On The Public Meeting
 To Discuss the NWS Plans to Collect, Distribute, and Archive WSR-88D Level II Data
 Held At Silver Spring, MD on June 18, 2003
 In Addition, Questions Not Answered In The July 25 Posting Are Restated
 (As Of September 3, 2003)

DATA DISTRIBUTION:

Q: What is the total amount of data being passed and the bandwidth requirement for ALL radar sites?

NWS RESPONSE: A 128 kbps communications expansion per radar is being added. By the end of 2003 we expect to have 124 radars and by the end of 2004 we expect to have 132 radars on the network. Experience shows the 128 kbps will leave considerable room for adding more data. The bandwidth required has three major dependencies: the volume coverage pattern (VCP) being used, the amount of weather returns, and the structure of the weather (which impacts the compression efficiency). The VCP usage is a site decision based on operational needs and varies by day, season, and hour. The table below includes the annual average usage rate for the various VCPs. Please note that VCP12 and 121 will be added with RPG software Build 5, release scheduled for March 2004. Thus, we have no usage averages for these two new VCPs and are not sure how they will affect the usage rate of the other VCPs. We estimate the following data flow maximums (per radar):

<u>Volume Coverage Pattern (VCP)</u>	<u>Time To Complete VCP</u>	<u>Estimated Max Data Flow Rate (Compressed)</u>	<u>Average Usage In 2002</u>
VCP 11	5 minutes	63 kbps	9%
VCP 12	4.1 minutes	77 kbps	not avail.
VCP 21	6 minutes	41 kbps	43%
VCP 31 & 32	10 minutes	15 kbps	48%
VCP 121	5 minutes	77 kbps	not avail.

Q: How will other government agencies receive Level II data in real time.

NWS RESPONSE: The NWS will allocate ports on the Univ. Of Maryland server for this purpose. Details for requesting access will be published later in the year.

Q (New As Of 8/20/03): The NWS plans to install new and upgrade existing bandwidth at each site to 128kbps. Thus, all 124 (and later 132) will be connected at 128kbps?

NWS RESPONSE: Yes, as sites are connected to the NWS network there will be a dedicated 128 kbps per radar.

Q: (New As Of 8/20/03) Will users continue to receive data from CRAFT until we switch over to the NWS plan.

NWS RESPONSE: Yes. Beyond the transition point of sending data to the NWS server at the University of Maryland, OU will continue to receive the Level II data, via membership in Unidata. Details of their connection will be determined later in the year.

Q: (New As Of 8/20/03) Will and when will users receiving data from CRAFT begin to receive data from the newly added sites.

NWS RESPONSE: The CRAFT/OU server can handle the 124 radars we expect to have sending data electronically by the end of 2003. The data will be sent to the CRAFT/OU server via the NWS regional

servers and Internet2 “cloud” from the start. The NWS encourages the redistribution of data to users from these new sites as soon as practical. The transition plans for sending data to the University of Maryland server are to be determined. However, with its role in the Unidata family, OU will continue to receive the Level II data in real time at the end of FOC, it is just the routing of the data to get to OU that is yet to be determined.

DATA FORMAT:

Q: What site identification information will be included in the Build 5 metadata? Site location data is desired (e.g., lat/long/height of antenna feedhorn above sea level/siteid). How/where will this information be provided?

NWS RESPONSE: The Volume Record Header had 4 unused bytes. In RPG build 5.0 we plan on using these four bytes for the ICAO of the radar. The ICAO will be a four-letter ASCII representation of the “official” radar name. The end user can create a table and use the ICAO as an index into a pre-defined table in order to find out the desired information about that radar. Once ORDA is fielded the RDA Adaptable Parameters (message type 18) should contain all the specific information about the radar the user will need to know.

For additional information refer to the RPG Build 5.0 ICD for ArchiveII/User (2620010A). The date this ICD and sample data will be available will be announced in the next update of this forum.

Q: Are there any plans for a software version number to be placed somewhere to allow users to deal with future changes? How/where will this information be provided?

NWS RESPONSE: The NWS plans on adding a version number to the Volume Record Header. In RPG Build 5.0 the “Tape Filename” field will change from ‘ARCHIVE2.’ to ‘AR2V0001.’. This version number will change in the future if the headers, compression or data packaging is altered in anyway. Technical details will be provided in the RPG Build 5.0 ICD for ArchiveII/User (2620010A).

Q: The NWS needs to inform users about changes coming in future software changes well in advance.

NWS RESPONSE: The NWS has added a link on the Radar Product Central Collection Dissemination Service (RPCCDS) home page (<http://www.nws.noaa.gov/tg/rpccds.html>) to inform users of upcoming changes to WSR-88D data streams sent via the RPCCDS. The NWS will create a similar page for Level II users and place it on http://www.roc.noaa.gov/NWS_Level_2/ by the end of the year.

DATA QUALITY:

Q: Since the clock/time stamp issues will not be resolved until 2005, will there be sequencing information in the data headers from each radar site so we may collect and disseminate the data in the proper order and avoid future time stamps on incoming data?

NWS RESPONSE: The current data has radial and volume sequence numbers. Traditionally there should not be data sequencing errors. However, people have expressed concern about the accuracy of the time stamp on the radar data. We assume this becomes a “data sequencing” problem because the LDM pqact regular expression uses the timestamp to assign filenames at the receiving end. If this is the case, the end user could change the pqact regular expression or write a tailored decoder to process the data in the correct sequence without relying so heavily on the timestamp for the sequence of filenames.

In RPG Build 5.0, the Julian Date and Time in the Volume Record Header will be independent of the radar data. The BDDS will use its local clock to assign those fields. The accuracy of the BDDS clock will be maintained using Network Time Protocol (NTP)

PRICING INFORMATION:

Q: What will the pricing structure of external connections look like? For example, what charges will be incurred if a commercial vendor attaches directly to MAX or other GigaPOP? If we connect to a server provided by NWS?

NWS RESPONSE: Pricing information will be provided when the NWS provides distribution options by 1 December 2003.

DATA DISTRIBUTION OPTIONS:

Q: How will the university top-tier sites be determined? Have they been determined yet?

NWS RESPONSE: Unidata will determine the strategy for distribution to universities, in conjunction with their members. The date Unidata will identify the top-tier LDM server and further dissemination is TBD at this time.

Q: Use of satellite communications to distribute the data would be a possible way to equitably distribute the data to all requesters. Has this been considered?

NWS RESPONSE: We will provide a response to this question after more investigation is completed.

Q (New As Of 8/20/03): In regard to options for distribution to the private sector will be developed by 12/1/03, will members of the private sector then be able to select from the options or does the NWS plan on only delivering the data via one of the options?

NWS RESPONSE: This is still to be decided, but given the architecture, we hope multiple options will be available for the private sector to choose from. Users can make data receipt plans beyond what the NWS may propose.

Q (New As Of 8/20/03): In regard to options for redistribution for the privates sector, if only one of the options will ultimately be utilized, how will the NWS decide which option to make available?

NWS RESPONSE: See previous answer. We will need to work together to make a decision in the unlikely case only one solution is possible.

Q (New As Of 8/20/03). We strongly urge the NWS to allow users to access multiple entry points, namely the GigaPoP (Internet 2/Abilene) connected servers. This will allow maximum flexibility in system architecture.

NWS RESPONSE: Users can set up their own arrangements with the entry points (e.g., GigaPops, universities) now or anytime. The NWS is not trying to establish only one method of data distribution. With no restriction on the redistribution or use of the data, the private sector has freedom to select their data source.

PROGRAMMATIC QUESTIONS:

Q: Does the NWS have a site-by-site deployment and implementation plan?

NWS RESPONSE: The deployment schedule is not finalized. The NWS-schedule will be posted at http://www.roc.noaa.gov/NWS_Level_2/. It appears the servers to be installed at the NWS regional headquarters will be the last part of the network to be installed. The NSSL will install the servers within a two week period. Thus, is it likely that the 60 sites to join the network may come on very quickly and in no particular order. The NWS will post specific installation information when the servers are ready for installation.

Q: If the NWS will not provide Level II decoder and application software nor follow-on support for users, can the NWS provide links to information and software that is available?

NWS RESPONSE: Yes, the NWS will provide a “knowledge” page on: http://www.roc.noaa.gov/NWS_Level_2/ that will contain this type of information to assist Level II users.

Q: Who will support the private network? Where will private sector turn when they have problems, questions, and issues.

NWS RESPONSE: The NWS will need to work with the private sector to determine how this support will be provided. Initially, the NWS will provide information at: http://www.roc.noaa.gov/NWS_Level_2/.

Q (New As Of 8/20/03): NWS plans to have 124 radars on the network by end of 2003, 132 by end of 2004. Are the remaining unconnected sites all FAA or a mixture of FAA/DoD?

NWS RESPONSE: The remaining sites are a mixture of FAA (all 12 of them) and 15 DOD.

Q (New As Of 8/20/03): Are there any plans for the remaining CONUS sites [beyond the planned 132] to come on board?

NWS RESPONSE: Not at this time.

Q (New As Of 8/20/03): NWS will continue to use existing CRAFT server/infrastructure for delivery of data to the private sector until summer 2004 and then transition to a newly adopted architecture. Will any upgrades/redundancies be added to the existing CRAFT server/infrastructure in the meantime to ensure reliability?

NWS RESPONSE: No upgrades/redundancies to the server/infrastructure at the University of Oklahoma, using public funds, will be provided.

Q (New As Of 8/20/03): The delay between the completion of a radar elevation scan and that data being delivered to users should never exceed 30 seconds. And the average should be around 15 seconds.

NWS RESPONSE: Desk top studies show the data should be at the central collection point, Univ. Of Maryland, will be less than 10 seconds after the data are produced. The data will be collected in “bundles” of radials and sent to users. We do not wait for the completion of a volume scan or elevation sweep to send the data.

Q (New As Of 8/20/03). Reliability of the system should exceed 99 percent. That is, better than 99 percent of all available elevation scans should be available to external users.

NWS RESPONSE: The 95% reliability and 60 second latency of data receipt at a central collection point/server is the NWS requirement. We believe the architecture, hardware, and software chosen will easily exceed these figures, as the CRAFT experience has demonstrated. However, the NWS does not plan to expend significant resources (e.g., staff time or funding) to improve the reliability and latency if they exceed the NWS requirements.

Q (New As Of 8/20/03). The system needs to be able to adapt to new scanning strategies and new equipment without requiring an overhaul of the distribution system.

NWS RESPONSE: We agree and believe the system is scalable to the data flows possible if all data through and including dual polarization data are added.

Q: (New As Of 8/20/03) When will the switch over occur?

NWS RESPONSE: The timing of the switch over to the NWS network/use of the central collection point at the University of Maryland will be in 2004. The cut over date has not been determined yet, but will be

widely announced in advance. We envision an overlap period of transitioning the primary data flow to the University of Maryland server. Thus, for a period of time, both CRAFT/OU and Maryland servers will receive the data as top-tier sites. As the Maryland server and connections demonstrate their reliability, we can then plan on not continuing to send the data to both CRAFT/OU and the University of Maryland.

COMMENTARIES RECEIVED FROM PRIVATE COMPANIES

SUMMARY #1

The provision of weather services in the United States is the result of a successful and interdependent public/private partnership. Each sector readily acknowledges this partnership and in general seeks to improve the effectiveness of the partnership. Level II data presents the opportunity to significantly enhance the partnership's severe weather identification, prediction and alerting capability. In order to optimize this opportunity for our nation, Level II data must be disseminated to both the public and private sectors at timeliness and reliability levels consistent with the short fused nature of many severe weather phenomena. Accomplishing this will truly bring the largest payback to the nation on the investment it has made in a high-end Doppler radar network.

We were represented at the NWS June Public Meeting. It is our understanding that the following options were identified at that meeting that NWS could pursue to provide Level II data to the private sector:

One or more private sector companies provisions the needed service to others – In this circumstance, the NWS turns over dissemination of the data to commercial enterprise through the RFP process and subsequent receipt of data is obtained via vendor – client arrangements.

Family of Services – For years the NWS has centrally collected and disseminated publicly funded data sets via the telecommunications gateway and obtained fees on a cost recovery basis. Most recently this has included the Radar Products Service for WSR-88D Level III data. A similar service could be established for the WSR-88D Level II data.

An existing non-profit organization – Unidata, for example, which currently provides information services primarily to the academic community, was mentioned as a possible entity for serving in this capacity.

A jointly owned/operated independent cooperative – This organization would be formed around the shared need for receipt of WSR-88D Level II data. It would be run and be supported entirely by the private sector with fees and terms of participation established by participating members.

We believe that although Option 4 may look attractive, establishing some sort of “cooperative” would face significant hurdles. The most substantial of these hurdles would likely be the time and cost involved in establishing the coop in a manner that would meet the needs of the coop partners and be acceptable to the broader private sector user community.

Option 1 is similar to the NIDS program that was established originally to distribute Level III data from the NEXRAD network. This structure places one or more private company(s) as a “gate keeper” to public domain information. This resulted in significant problems during the NIDS era that eventually led to the termination of the NIDS program. It appears that history has taught us a valuable lesson in this area that we should not ignore.

Although an existing non-profit organization like Unidata may be continue to be effective in meeting the needs of the education and research communities, servicing the mission-critical timeliness,

dependability and reliability requirements of commercial operations is quite different. Additionally, legal issues could also present barriers. Therefore, Option 3 appears problematic.

So, by process of elimination (and because we think it makes the most sense) we come to Option 2. With the termination of the NIDS program, NWS successfully took on the collection and dissemination of Level III data. The history of timeliness, dependability, reliability and supportability relative to Level III data and the entire Family of Services has been and continues to be acceptable. Additionally, this option avoids having any private industry gate-keepers and makes public data available in an equitable manner. Therefore, this seems like a logical choice. However, as we noted at the June Public Meeting, data volumes associated with Level II data and the overall increase in data volume over the next several years will require a fresh and creative look at collection and communications systems and processes. Timeliness, reliability and dependability requirements will continue to be demanding. Ensuring these demands will also ensure the nation receives the full benefit of its radar investment. We urge NWS to consider this as it continues to work this issue.

In summary, we believe that given the existing data services infrastructure and mission of the NWS to provide access to public data along with the partnerships' opportunity to enhance weather services to the nation that a "family of services" option is the best choice for Level II Data. We want to thank the NWS for giving its private sector partners the opportunity to provide input into this very important decision and would be happy to provide further elaboration or respond to any questions.

SUMMARY #2

Response to Public Meeting on NWS Plans to Collect, Disseminate and Archive WSR-88D Level II Data

Overview:

The National Weather Service (NWS) hosted the "Public Meeting on NWS Plans to Collect, Disseminate and Archive WSR-88D Level II Data" on June 18, 2003 at NWS headquarters in Silver Spring, MD. We offer the following points for consideration in the design and implementation of the final architecture for dissemination of these data to the private sector. We are available for any follow up comments or questions on this topic.

In order to establish a cohesive dissemination service for WSR-88D Level II data as well as establish a new paradigm for dissemination of other high volume data sources of the future, we believe a number of factors should be considered such that the needs of all users and benefactors of critical weather information can be adequately addressed. Of particular importance are the requirements of the private sector. During the meeting several references were made to the collection and dissemination requirements of the National Climatic Data Center and National Centers for Environmental Prediction. However, there was no mention of or solicitation for input from the private sector in this regard.

The private sector is an integral part of this country's public notification and alerting process, particularly when it comes to disseminating critical weather information and protecting vital economic assets. Specific examples of this role are evidenced by the vast array of media broadcast outlets throughout the country as well as critical transportation interests that are served by the private sector weather providers. Since the NWS relies on media outlets to help get the word out on critical weather alerts, and since the private sector is the primary means of dissemination to these media outlets, the private sector should be recognized as being on the critical path of the nation's dissemination and notification infrastructure. As such, we believe our input on requirements deserves careful consideration.

Another area of concern is the ever-increasing volume of data streams that are being generated by ever-improving sensor technologies. This reality is quickly outpacing currently available communications capacities and is also making use of the existing data dissemination paradigms ever more challenging and cost prohibitive. Hence, we believe that future dissemination services should provide accommodations for access to and placement of vendor owned and operated processing capabilities as far upstream as possible in order to reduce the data volumes and optimize communications requirements. This will allow for more voluminous data types to be handled in more efficient and cost effective manners, which will in turn serve to enable more effective dissemination of alerts to the citizenry.

By evaluating and establishing new mechanisms for the dissemination of high volume data types to the private sector, we can evolve toward new paradigms designed to serve our collective needs well into the future. Furthermore, by working together to establish requirements of all interested parties, we can more effectively enhance the mission effectiveness of both the NWS as well as the private sector and ultimately provide higher levels of service to the tax paying public and other consumers of weather information.

Options:

During the meeting a number of options were mentioned that the NWS could pursue to make WSR-88D Level II data available to the Private Sector. These included:

1. An existing non-profit organization – Unidata, for example, which currently provides information services primarily to the academic community, was mentioned as a possible entity for serving in this capacity.
2. A jointly owned/operated independent cooperative – This organization would be formed around the shared need for receipt of WSR-88D Level II data. It would be run and be supported entirely by the private sector with fees and terms of participation established by participating members.
3. One or more private sector companies provisions the needed service to others – In this circumstance, the NWS turns over dissemination of the data to commercial enterprise through the RFP process and subsequent receipt of data is obtained via vendor-client arrangements.
4. Family of Services – For years the NWS has centrally collected and disseminated publicly funded data sets via the telecommunications gateway and obtained fees on a cost recovery basis. Most recently this has included the Radar Products Service for WSR-88D Level III data. A similar service could be established for the WSR-88D Level II data.

With regard to the options listed above, the possibility of an existing non-profit organization (Option 1) stepping into the operational realm to facilitate dissemination of the data seems unlikely. Many organizations of this nature either do not have the infrastructure to support such an operation and/or may be legally or otherwise prohibited from taking on such a role. With regard to the specific mention of Unidata, they are self-admittedly not an operational data center and user participation in their programs is limited. Therefore, it seems a remote possibility that they will be able to act in this capacity.

Additionally, we believe it is highly unlikely that a cooperative (Option 2) of some type can be formed. The transactional costs of creating such an entity are much too expensive and time consuming for this approach to be practical. Complicating this scenario is the potential for some private sector companies to object to the ground rules established by a particular collaboration. In this instance, the government might be forced to entertain multiple collaborations. As a result, this option may not be as clean to administer from the government perspective as it might seem initially.

If collaboration does occur, we believe it will happen in the form of multiple private companies being the primary service providers to others (Option 3). In this manner, the relationship can be an ordinary vendor-client arrangement, or parties can enter into a strategic relationship that assures long-term service

at a negotiated price. Since multiple vendors are involved in being primary service providers, there is sufficient competition to keep prices at the marginal cost of providing the service. This approach has been successfully attempted previously and while many in the weather community have differing opinions as to the viability of this concept going forward, it is certainly an avenue with numerous benefits worthy of exploring further.

The most straightforward option and one, which seems to offer the greatest chance of success is a Family of Services type service (Option 4). It is our opinion, however, that for this to adequately meet end user needs both today and in the future several service enhancements must be considered. Details are discussed in the following section.

Recommendations:

As a private sector entity serving the critical weather information needs of end users which include media outlets, corporate/government/academic decision makers as well as consumers in the general public, we are most interested in data dissemination solutions that address timeliness, reliability and supportability attributes. In addition, those solutions that provide for the ability to optimize use of required communications bandwidth are similarly desired.

The approach of creating a Family of Services type service is attractive from the perspective that it makes available publicly funded data in an equitable manner. This appears to be consistent with the NWS mission, speaks to the needs of a broad spectrum of users and has a proven track record of success. Simply implementing a like service for purposes of delivering high volume data sets, however, will not adequately meet the technical requirements of the same. Any new service must address the following in order to meet the needs of the private sector and end users, all of which are largely self-evident.

- **Timeliness** – The primary goal of WSR-88D Level II data dissemination is to enhance public safety during severe weather. In truly severe situations, minutes and seconds matter. There is no substitute for dissemination speed.
- **Reliability** – Given the potential impacts on life, limb and property, the service must be available when the circumstances are most threatening. Even very short outages can seriously affect the perceived value of the information.
- **Supportability** – Whenever the service is interrupted or delayed, it is vital that there is someone to contact who can identify and/or correct the issue. Private companies succeed or fail based on the level of service they are able to provide clients in the worst of circumstances.

All three of these needs drive the recommendation in the same direction. To assure timeliness, reliability and supportability, there should be as few “hops” between the radar sites and the ultimate clients as possible and capabilities for performing data reduction should be provided as far upstream as possible.

With regard to “hops”, ideally the data should be made available on a local or regional basis. However, given economic realities and logistics of providing access at multiple locations this may not be a practical option at this time. At a minimum, this capability should be considered for future implementation with this and/or other data sets.

With regard to data volumes and communications requirements, today’s aggregate data volume of approximately 6mbs is fairly manageable, but 5-7 years out this volume could increase to 150mbs given proposed changes to the NEXRAD volume coverage patterns, dual-polarization, etc. While price decreases in WAN connectivity are possible, they are far from assured. Placing substantial computational resources at the central collection site (and more desirably at the regional collection points) will enable

intelligent and adaptive data reduction and/or product generation before huge communications costs are incurred. The significance of this issue is difficult to overstate.

Conclusion

Ultimately, we are in favor of any solution for provision of this information to the public sector that addresses the timeliness, reliability and supportability attributes described herein. As a practical matter, the options that make most sense appear to be either enabling multiple commercial enterprises to act as primary disseminators or building upon the existing Family of Services dissemination model.

Given the mission of the NWS to provide unrestricted access to publicly funded data and its existing data services infrastructure, a Family of Service type service would seem like the logical choice for making these data available. However, to address the potential data volumes going forward, appropriate accommodations as set forth above should be considered when constructing such a service.

We are very interested in participating in a WSR-88D Level II dissemination system regardless of the chosen method. We will also be pleased to provide more detailed feedback on these or other service options upon request. WSR-88D Level II data is a precious resource and we are eager to participate in maximizing its usage through a fast and robust collection and dissemination system that is designed to meet our collective needs both today and in the future.

SUMMARY #3

This letter is a formal response to your request for input on the future plans of the National Weather Service (NWS) for disseminating WSR-88D Level II data. We are fully supportive of the NWS's efforts to make this data available from all WSR-88D sites as quickly as possible. We commend the NWS for taking a leadership position in these efforts.

We do have concerns about the proposed business model for distribution of Level II data to commercial entities. It is apparent from the web site that one alternative the NWS is considering is that a group of commercial companies would get together and form a non-profit corporation solely for the dissemination of Level II data. We think that this is a bad idea, for several reasons, not the least of which is that it will put an undue burden on the largest companies (who are the only ones who have the technical and organizational expertise to efficiently do this) and subsidize the smaller entities.

We feel that there are sufficient existing models for Level II distribution. These include the Family of Services model (where the NWS charges fees for access to each radar to recover the marginal cost of providing that access), and the NIDS model (where a limited number of subscribers are allowed access, but then are obligated to provide access to anyone else who wants it). Both of these alternatives have been proven to work well, providing access to all who want it, while at the same time preserving the competitive balance that keeps costs down. We would encourage the NWS to consider either of these approaches.

If the NWS is adamant about having a single non-profit provider of Level II data, then we could live with an existing non-profit entity like UNIDATA being that point of access. This would avoid most of the concerns around creating a new company, and capitalize on UNIDATA's expertise in data distribution.

Questions NOAA's National Weather Service (NWS) Has Received
During And After The Public Meeting
To Discuss the NWS Plans to Collect, Distribute, and Archive WSR-88D Level II Data
Held At Silver Spring, MD on June 18, 2003
(As Of July 25, 2003)
More Questions And Answers Will Be Added

DATA DISTRIBUTION:

Q: What is the total amount of data being passed and the bandwidth requirement for ALL radar sites?

NWS RESPONSE: 128 kbps communications expansion per radar is being added. By the end of 2003 we expect to have 123 radars on line. By the end of 2004 we expect to have 132 radars on line. In an update to this page in August we will provide more details on expected bandwidth requirements, which will be much less than 128 kbps per site.

Q: What about changing the architecture to allow sharing of data among the NWS regional servers and other top-tier nodes to better ensure redundancy and reliable data flow.

NWS RESPONSE: The regional servers and the DS3 connections from the regional headquarters and their serving Gigapop are large enough to handle this load. The NWS will likely implement this type of redundancy and use of the LDM auto-failover capability to ensure data flow in the case of an outage at the central collection point.

Q: The architecture appears to have several single points of failure: local forecast office, communications links between the forecast offices and the regional headquarters, the regional headquarters servers, the DS3 lines to the regional Gigapops, the regional Gigapops, and at the Univ. Of Maryland central collection point. Will the NWS consider a more robust and diversified architecture?

NWS RESPONSE: This response will answer each major component of the data flow. The Base Data Distribution System (BDDS) is a single point of failure. The NWS data requirement availability did not support the added cost of purchasing additional BDDSs to serve as on-site spares - spares are available from the National Logistics Support Center (next flight or next day air shipment to forecast offices). The frame relay circuits which will carry the data between the forecast offices and their regional headquarters have redundancy and have a high service restoral priority. There are two servers in each regional headquarters, thus a "hot" spare on site. The DS3 lines between the regional headquarters and their gigapop are a single point of failure. The NWS will look into the feasibility of using their commodity internet as a backup for the DS3 connections. The Gigapop servers are redundant. The Univ. of Maryland Gigapop has several redundancies built in. The NWS will continue to examine ways to reduce the single points of failure where they are low/no additional costs/impacts to the NWS in meeting the NWS data requirements.

Q: How will other government agencies receive Level II data in real time.

NWS RESPONSE: This need is not currently in the architecture. The NWS acknowledges that the need should be addressed and the process of access will be disseminated in the coming months.

Q: Will the NWS locally store the data in case of interruption to the data flow?

NWS RESPONSE: The maximum buffer size on the regional servers is 15 minutes (aggregate for all sites within a region). The BDDS can buffer up to one hour of data. The LDM is configurable to set the amount of "old" data will be transmitted once connectivity is established. The LDM configurable value will be set based on a balance between trying to recover as much data as possible for the archives, yet meet real-time NWS operational requirements.

Q: The data delivery reliability figure of 95% is too low. LDM supports a 99.9% availability

NWS RESPONSE: The 95% reliability of receipt of data at a central collection point/server is the NWS requirement. We believe the architecture, hardware, and software chosen will easily exceed this figure, as the CRAFT experience has demonstrated. However, the NWS does not plan to expend significant resources (e.g., staff time or funding) to improve the reliability and latency if they exceed the NWS requirements.

DATA FORMAT:

Q: What site identification information will be included in the Build 5 metadata? Site location data is desired (e.g., lat/long/height of antenna feedhorn above sea level/siteid). How/where will this information be provided?

NWS RESPONSE: Details on this will be provided during the next update in August.

Q: Are there any plans for a software version number to be placed somewhere to allow users to deal with future changes? How/where will this information be provided?

NWS RESPONSE: The NWS plans to add the RPG software build information, among other information, to the metadata header record to be added in RPG Build 5, spring 2004 release. Details on this will be provided during the next update in August.

DATA QUALITY:

Q: Why are WSR-88D time stamps not accurate and what are the NWS plans for correcting this problem?

NWS RESPONSE: There are two time stamps associated with WSR-88D data. The Radar Data Acquisition Data (RDA) time stamp is set by the RDA clock and signifies the start of the volume scan. The Radar Data Generator (RPG) time stamp is set by the RPG clock and signifies the time the RPG generates a given product. Both clocks, hence time stamps, are subject to clock "drift." The RDA clock is checked manually monthly by radar technicians who set the clock manually to within 5 seconds of a WWV time "hack." The RDA clock is based on early 1980s technology, but will be replaced beginning in the second half of 2004 with the Open RDA that will have GPS technology to ensure the time clocks are correct. With the recent deployment of the Open RPG, the RPG clocks are controlled as follows: (1) for NWS RPGs, the RPG clock is synchronized with the AWIPS NPT; and (2) for DOD and FAA RPGs no network synchronization is available; However, for the DOD and FAA RPGs (excluding the 4 DOD WSR-88D systems not connected to an NWS forecast office), the NEXRAD Program plans to add frame relay connections in the spring of 2004 which will enable the time synchronization with the AWIPS NPT.

Q: Since the clock/time stamp issues will not be resolved until 2005, will there be sequencing information in the data headers from each radar site so we may collect and disseminate the data in the proper order and avoid future time stamps on incoming data?

NWS RESPONSE: Details on this will be provided during the next update in August.

Q: Prior to Open RDA, what data will be provided for users to know how to correct the RDA time stamps? For example, similar to what is done for RCM scheduling, at the beginning of each volume scan a delta time can be determined at the RPG by simply computing the time difference between the RPG and the radial data message time stamp (this assumes the RPG clocks are synchronized with AWIPS via NTP). How/where will this information be provided?

NWS RESPONSE: The NWS does not plan to provide time stamp "delta" information because it is not available to the NWS. Please see the NWS response to the preceding question for additional information.

PRICING INFORMATION:

Q: What will the pricing structure of external connections look like? For example, what charges will be incurred if a commercial vendor attaches directly to MAX or other GigaPOP? If we connect to a server provided by NWS?

NWS RESPONSE: Pricing information will be provided when the NWS provides distribution options

later in the year.

DATA DISTRIBUTION OPTIONS:

Q: We would like to see something similar the current Central Radar Server Multicast method. We would prefer to install a dedicated circuit from the server to our facility and pass the data through to our customers. Also, I will still throw in our latency appeal. I know the NWS is not required to meet these at this time, but we would love to see a 99% and 10 second latency requirement.

NWS RESPONSE: Thank you for your suggestion. The NWS will consider your recommendation in providing private sector options for connection by 1 December 2003. The 95% reliability and 60 second latency of data receipt at a central collection point/server is the NWS requirement. We believe the architecture, hardware, and software chosen will easily exceed these figures, as the CRAFT experience has demonstrated. However, the NWS does not plan to expend significant resources (e.g., staff time or funding) to improve the reliability and latency if they exceed the NWS requirements.

Q: Is the NWS making a provision if the private sector does not form a consortium to receive and redistribute the data in an equitable manner.

NWS RESPONSE: The NWS is looking at several options. During the transition phase, we will leverage the existing CRAFT capabilities at the University of Oklahoma. The NWS will support and rely on the continued operation of the server at the University of Oklahoma. For the summer of 2004 time frame when we move from this transition phase, we could look at least two possible options: place a solicitation for the establishment of a non-profit organization to serve as the distribution point; or develop a government distribution point on a cost-incurred reimbursement basis. The NWS will provide the private sector options for connection by 1 December 2003.

Q: How will the university top-tier sites be determined? Have they been determined yet?

NWS RESPONSE: Unidata will determine a strategy, in conjunction with their members. The date Unidata will identify the top-tier LDM server and further dissemination is TBD at this time.

Q: Use of satellite communications to distribute the data would be a possible way to equitably distribute the data to all requesters. Has this been considered?

NWS RESPONSE: We will provide a response to this question in August after more investigation is completed.

PROGRAMMATIC QUESTIONS:

Q: Does the NWS have a site-by-site deployment and implementation plan?

NWS RESPONSE: The deployment schedule is in internal NWS coordination. The NWS-schedule will be posted at http://www.roc.noaa.gov/NWS_Level_2/. We are working on the page and expect to begin populating the page in September.

Q: Would the NWS accept input on the order for installing and connecting the remaining radars to the electronic collection network.

NWS RESPONSE: Yes. The input will be considered, but the NWS operational considerations will come first (e.g., replacing existing commercial connections the NWS is paying for, providing access to real-time data along coastal regions prone to hurricane landfall for National Centers For Environmental Prediction, remote RDA shelters)

Q: How will the timing work regarding the availability of the data? The NWS states they will provide a proposed distribution solution within 120 days of the close of the public comment period, but will the data be distributed via the Internet2 solution using the LDM be distributed in September 2003?

NWS RESPONSE: The NWS will support the University of Oklahoma/CRAFT server/redistribution capability through at least June 30, 2004. This will serve as a transition period until the final NWS

architecture is implemented.

Q: If the NWS will not provide Level II decoder and application software nor follow-on support for users, can the NWS provide links to information and software that is available?

NWS RESPONSE: Yes, the NWS will provide a “knowledge” page on:

http://www.roc.noaa.gov/NWS_Level_2/ that will contain this type of information to assist Level II users.

Q: How does the NWS Level II network schedule match up with RPG software releases.

NWS RESPONSE: No changes in the Level II content or data amounts or in the Base Data Distribution Systems (BDDS) in Build 3, just released. Same is true for Build 4, release to begin 9/30/03. However, with the release of Build 5, release to begin 3/31/04, two new volume coverage patterns (which will cause more data to flow and introduce new scanning angles/scanning strategies) will be implemented. The data compression and local data manager functions will move to the BDDS in Build 5. In addition, metadata will be added to the data at the beginning of each volume scan in Build 5.

Q: The NWS needs to inform users about changes coming in future software changes well in advance.

NWS RESPONSE: The NWS will provide a Users Web Page for both RPCCDS users and Level II users to inform users of upcoming changes to WSR-88D data streams. The location of these web sites will be announced via the NWS FOC email list and an email addressed to the people who attended the 18 June 03 meeting, at a minimum.

Q: Who will support the private network? Where will private sector turn when they have problems, questions, and issues.

NWS RESPONSE: The NWS will need to work with the private sector to determine how this support will be provided. Initially, the NWS will provide information at: http://www.roc.noaa.gov/NWS_Level_2/.

Q: The Unidata Local Data Manager on-line documentation is out of date. When will it be updated?

NWS RESPONSE: Unidata has provided the updated URL:

<http://my.unidata.ucar.edu/content/software/lDM/index.html>, link to LDM6.0.13. An updated tutorial will be available fall, 2003.