4.1 NOAAPORT BROADCAST CHANGES

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1. INTRODUCTION

To support ever increasing data needs and future growth, the NOAAPORT Broadcast is undergoing changes in both format and capacity. These changes involve expanded use of frame compression, reallocation of products among the existing channels, and initial conversion of one of the former carriers to Digital Video Broadcast (DVB) format.

2. GOES DISTRIBUTION CHANGES

To support these data needs and the planned migration to DVB broadcast format, all of the Geostationary Operational Environmental Satellite (GOES) imagery products are now being compressed frame by frame, and certain GOES products have been reallocated differently among the existing carriers. All of the continental United States (CONUS) GOES_EAST and GOES_WEST imagery products are now exclusively broadcast on the former GOES_EAST channel. All of the other (or OCONUS) GOES imagery products are now broadcast on the 4th channel, formerly known as the data collection platform (DCP)/nonGOES imagery channel. This reallocation and compression of GOES imagery allows the former GOES_WEST carrier to be temporarily freed from active service and used for the initial DVB broadcast checkout and validation phase.

3. DVB MIGRATION

What is DVB? DVB is Digital Video Broadcast, the technology used for commercial satellite television broadcast and other data broadcast applications. Use of DVB technology will allow the NOAAPORT broadcast to implement proven Internet Protocol (IP) over satellite protocols based upon open standards.

The advantage gained by incorporating DVB technology for the NOAAPORT broadcast is the ability to use relatively low-cost DVB receivers at each NOAAPORT receive site and to support future bandwidth expansion with minimal hardware changes. Commercially available DVB receivers can be obtained from a multitude of vendors with varying features, throughput, and cost. These receivers combine the functionality of a satellite demodulator and an IP router into a single device. Thus, a single DVB receiver will demodulate a DVB carrier and route the decoded data to a 100BaseT Local Area Network (LAN) connection. In addition, a single DVB carrier can contain multiple logical data channels, or PIDs, thereby allowing multiple data streams to be logically multiplexed on a single DVB carrier and decoded for distribution on a site LAN. Once conversion to DVB is complete, a single DVB receiver can replace all of the considerably more expensive, dedicated, and limited bandwidth satellite demodulators currently required for each of the NOAAPORT carriers.

4. SYSTEM DESIGN

The NOAAPORT Satellite Broadcast Network (SBN) protocol has been incorporated into the IP over satellite protocol by transmitting each of the existing format SBN protocol frames within an IP multicast packet. Transition to the DVB technology required minor modifications to existing NOAAPORT broadcast software. At the NOAAPORT Master Ground Station (MGS), software on the Uplink Communications Processor (CP) was modified to support IP multicast transmission. In addition, a commercial IP Encapsulator is required to encapsulate the IP multicast packets for broadcast to NOAAPORT users via a DVB modulator. Conversely, on the NOAAPORT receive side, the DVB receiver will demodulate the carrier, decode the DVB protocol, and transmit IP multicast packets to the site CP via a LAN connection. Software on the receive CP must then recover the SBN protocol frames from the IP multicast packets. Once the SBN protocol frames are recovered, the remainder of the downlink receive processing is identical to the previous data handling for the NOAAPORT broadcast.

5. AWIPS IMPLEMENTATION

Redundant DVB receivers will be installed at each Advanced Weather Interactive Processing System (AWIPS) site, eliminating a single point of failure for the satellite demodulator. For AWIPS, a dedicated data LAN connection between each DVB receiver and each site CP will be provided to ensure that the data products ingested from the satellite do not compete with other site data distribution functions of the CP.

The primary goal of the DVB broadcast conversion for AWIPS is to provide expanded NOAAPORT broadcast capacity for new products such as additional model data with minimal cost per site.

6. DVB-RELATED ISSUES

Initial problems were encountered with the ability of many commercial off-the-shelf (COTS) DVB receivers to reliably receive data using a 1.54 Mbps T1 carrier. The

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planned use of 7/8 coding implies a symbol rate of only 1.147 million symbols/sec. This relatively low symbol rate is at or below the minimum specification of many commercially available DVB receivers. Operation at this low symbol rate appears to cause many DVB receivers to become susceptible to interference from nearby carriers of equal or higher amplitude. One approach to overcome problems associated with this low data rate is to place an L-band bandpass filter between the antenna low-noise block (LNB) and the DVB receiver to attenuate these nearby carriers.

However, once the capacity of the DVB carrier is increased beyond the initial T1 data rate, this low data rate performance should no longer be a concern. The DVB broadcast format and related hardware/software products should allow use of up to a full satellite transponder for the NOAAPORT broadcast, thereby achieving nearly a 43 Mbps data rate with 7/8 encoding.

Note that the reliable receipt of IP multicast packets at relatively high data rates may also require changing some operating system (OS) default settings such as maximum network receive buffers for a Linux OS process.

7. SUMMARY

The National Weather Service (NWS) plans an initial operational capability using the existing single T1 carrier bandwidth capacity in June 2004. Later in the fall of 2005, plans anticipate expanding the single DVB carrier to possibly a full transponder and ceasing operation of the existing four satellite broadcast carriers at the former maximum 5.2 Mbps capacity.

These planned changes in the NOAAPORT broadcast will allow greatly expanded broadcast capacity to handle the expected growth in imagery and other data products. In addition, the adaptation of these open standards-based and readily available DVB products will significantly reduce NOAAPORT receive site equipment costs.