**P1.33** THE NCF - HOW DOES IT OPERATE - AN UPDATED LOOK

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## 1. INTRODUCTION

The Advanced Weather Interactive Processing System (AWIPS) Network Control Facility (NCF) located at the National Weather Service's (NWS) facilities in Silver Spring, Maryland, serves as the 911 emergency call center for AWIPS, staffed 24 hours a day, 7 days a week. In this capacity, the NCF engineers are constantly working on problems that range from a minor issue on a single component at a site to major outages that affect multiple sites. However, the NCF is more than just a help center, it also serves as the communications hub for the entire AWIPS communications network (ACN). Thus, the more than 150 AWIPS sites depend on the NCF systems to disseminate their critical forecasts and warnings. The intent of this paper is to update last year's paper and to focus on the upgrades implemented over the last year that better enable the NCF to handle its two primary functions: communications hub and help desk.

## 2. COMMUNICATIONS HUB IMPROVEMENTS

The last year has seen a significant increase in the amount of traffic flowing through the NCF. These increases include more radar products as a result of the Open Radar Product Generator (ORPG), the addition of Level II/III archiving of radar products, the addition of Eta-12 product, and the implementation of the National Digital Forecast Database (NDFD). This increased data flow has placed two significant demands on the NCF from an operations perspective:

- The need for more efficient processing of products to reduce delays
- Necessary redundancy to allow the NCF engineers to quickly restore service during communications failures.

The technical discussion of what changes were made to increase processing efficiency are included in the Paper 4.4, *Network Control Facility (NCF) Upgrades*, by LeRoy Klet. The following discussion concentrates on the increased communications redundancy available to the NCF engineers. The added redundancy within the NCF has targeted four very broad areas: (1) the message handling system (MHS), (2) the satellite broadcast network (SBN), (3) the NCF local area network (LAN), and (4) a backup NCF (BNCF).

### 2.1 *Message Handling System (MHS)*

The sites use the MHS to send products via the AWIPS wide area network (WAN) to the NCF for distribution to various communications links: the SBN, the NOAA Weather Wire Service (NWWS), the WAN, the NWS Telecommunications Gateway (NWSTG), and various file servers. This service was upgraded by spreading the load from the sites across six servers at the NCF. Should the NCF lose an MHS server, the NCF engineers can quickly repoint the failed server's traffic to one of the other servers through the use of automated scripts. If the loss involves more than one NCF server, NCF engineers can repoint the MHS services of up to two NCF MHS servers to the remaining servers without a significant degradation in processing speed. More than two servers can be repointed to the remaining servers, but service is degraded; hence this scenario would force the NCF engineers to move the services to the BNCF, which is discussed later.

### 2.2 *Satellite Broadcast Network (SBN)*

Over the last year there have been two major upgrades to the SBN to improve overall redundancy within the NCF. First, the older HP-UX uplink servers within the NCF were replaced with newer, faster Linux-based servers. In the past, two HP-UX servers were used to process the four channels associated with the SBN. The new configuration has one Linux-based server for each SBN channel. Each processor is capable of handling the full traffic load (four channels). Once again using automated scripts, the NCF engineers can quickly bypass a failed uplink server by pointing that particular channel to one of the other servers. Thus, even with the failure of three servers, the NCF is still able to process the traffic destined for the SBN. Second, the HP-UX communications processors (CPs) at the Ft. Meade, Maryland, Master Ground Station (MGS) were also upgraded to Linux-based servers. Just like the uplink servers, there is one CP per channel and each CP is capable of processing all four channels. Thus, this configuration can accommodate up to three CP failures at one time without experiencing an extended loss of service.

### 2.3 *NCF LAN*

In order to more effectively process the increased traffic load through the NCF, the NCF's internal LAN

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was upgraded by adding dedicated routers between the NCF and NWSTG. This helps to reduce the traffic load through the NCF's primary routers. Additionally, the new configuration includes two routers between the NCF and the NWSTG to provide the necessary redundancy. Should one of these routers fail, the second router automatically (without NCF engineer intervention) handles the traffic. The NCF's primary routers interfacing the WAN to the NCF LAN were upgraded to 100-Mbps interfaces. Finally, the number of available NCF LAN interfaces was significantly increased via the addition of two 24-port HP Procurve switches. This upgrade provides necessary future expansion on the NCF LAN.

### 2.4 *BNCF*

The most far-reaching addition to NCF operations was the installation and commissioning of a BNCF in Fairmont, West Virginia. Previously, this facility only housed the Backup MGS (BMGS) capability. In August 2002, additional equipment was added to this configuration to support the major NCF communications hub and call center functions. The call center functions are addressed in Section 3. The BNCF has full connectivity to the AWIPS WAN, so should a catastrophic failure sever communications with the NCF, the sites (after some automated configuration changes) could use the communications facilities at the BNCF to ensure necessary product distribution to include the uplinking of watches and warnings via the BMGS also in Fairmont. The BNCF also has connectivity with the NESDIS, so that the GOES satellite imagery can be sent directly to the BNCF for uplinking via the BMGS. The BNCF could be used to overcome a critical MHS failure at the NCF. Through an automated script, the NCF engineers can point the individual sites' MHS services to the BNCF. The BNCF has been designed with flexibility to allow varying degrees of failover ranging from a partial switch (e.g., MHS only) to switching all NCF functionality to the BNCF (e.g., MHS, SBN, NESDIS connectivity, etc.). During the BNCF acceptance testing, NCF engineers successfully switched all services from the NCF to the BNCF in approximately 20 minutes.

### 2.5 *Staffing Considerations*

All the aforementioned changes have significantly increased the reliability/availability of the NCF from a communications hub perspective; however, this increased redundancy has increased the complexity in identifying possible problems and then executing the necessary procedures to fail over to a backup system. This complexity requires a through understanding of AWIPS, the AWIPS-unique processes, product flow, and networking. Thus, the NCF has implemented a separate communications section within the operations staffing. There are eight to nine members dedicated to this function. Every member of the communications section completes the NCF's Basic Engineering Course (BEC), passes a certification test, and then works the standard help desk positions. Those wishing to specialize in the communications area must demonstrate a good working knowledge of networking principles and communications. For instance on the current communications staff, four members are Cisco Certified Network Associates (CCNAs), one member is a Cisco Certified Network Professional (CCNP), and two other members have current, extensive networking experience with one of the major U.S. telecommunications companies. Finally, the NCF Team has a networking subject matter expert (SME) who holds certifications to include CCNP and three different Microsoft certifications.

There are ongoing on-the-job training sessions for the communications engineers to ensure they stay abreast of the latest upgrades/changes to the AWIPS communications. A member of the communications staff is constantly and proactively monitoring the NCF and AWIPS communications interfaces looking for any anomalies and quickly employing the built-in redundancy to correct any identified problems.

## 3. OPERATIONS IMPROVEMENT

As mentioned earlier, the most significant upgrade to the help desk/call center functions of the NCF has been the addition of the BNCF. In addition to the capabilities highlighted above, the BNCF allows the NCF engineers to perform their normal call center functions to include monitoring the AWIPS enterprise via HP OpenView IT Operations (IT/O), answering calls from the sites with regards to problems, accessing sites to correct problems, and tracking all actions in the Remedy trouble tracking database. The NCF and BNCF trouble ticket databases are kept in sync via Remedy's Distributed Server Option (DSO) software. As with the communications portion of the BNCF, operations can be partially or fully switched to the BNCF. For instance, if the IT/O functions failed at the NCF, the engineers could switch this portion to the BNCF. The NCF Team could physically remain at the NCF, but use the BNCF to provide proactive site monitoring via IT/O. In the case of a wholesale failure at the NCF, the team would deploy to Fairmont, West Virginia (approximately a 4-hour drive from Silver Spring, Maryland) and stand up NCF operations at the BNCF.

There are some current limitations when full operations are transferred to the BNCF. First, the current BNCF telephone system does not support automatic call distribution (ACD); thus, the system does not have the same capabilities as the NCF to efficiently distribute the calls based on NCF engineer availability. Second, the number of NCF engineer positions at the BNCF is currently limited to five. The NCF has six frontline positions, six backline positions, and a communications position. Future upgrades to the BNCF may entail adding more positions. In order to remain familiar with BNCF operations, members of the NCF Team will deploy to Fairmont twice a year to run actual operations from the BNCF for two evenings during each deployment.

## 4. SUMMARY

As AWIPS has continued to adapt to meet the every-increasing demand for more information and products, the NCF continues to upgrade to ensure the NCF can accommodate these demands. Over the last year the NCF Team has implemented key upgrades targeted at providing more redundancy in support of the NCF's role as the communications hub for AWIPS. This has included upgrades to the MHS, the SBN, and the NCF LAN. However, the most far-reaching improvement has been the addition of the BNCF. The BNCF provides a vital capability to ensure continuity of operations should the NCF experience a major failure. Under normal circumstances the chance of a full switch of operations and communications to the BNCF would probably be very minimal; however, the events of 911 changed have forced the National Weather Service to provide extra insurance needed to ensure the NWS' sites can continue to meet their mission should the unthinkable occur. The BNCF serves their purpose.