Contribution to the Working Group
on
Meteorological Workstations
Third Workshop on Meteorological Operational Systems
18 - 22 November 1991 at ECMWF, Reading, UK

Jordan C. Alpert

Plans for the NMC Workstation Facility

Modern workstations are and will be as essential to NMC progress
as supercomputers. NMC is spending considerable resources in the
workstation area but to avoid duplication of effort,
fragmentation of activities, improve and manage computer systems,
maximize connectivity between components, and minimize
maintenance costs, the NMC has established the Workstation
Development Project.

The purpose of the workstation development project, begun in the
fall of 1991, is to develop, implement and manage the NMC
Workstation Facility (NWF) which includes all of the workstations
used to support both operations and research and development
within the National Meteorological Center. This project will be
responsible for decisions that affect the NWF including
procurement review as well as decisions on the data flow, data
formats, data access, display routines, standards, documentation,
maintenance support and configuration management, as well as for
all applications software developed for the NWF. The Project
Manager has the authority to make recommendations to the NMC
Director regarding the allocation of resources.

The functions of the WDP are to:

    Ensure that the development activities of the NMC are
    consistent with the overall NWS Modernization.

    Establish the data flow necessary to support workstations.

    Ensure that development activities conform to standards.

    Provide the commercial off-the-shelf software required to
    support the workstation development activities.

    Institute configuration management policy for the NWF.

    Make recommendations for and review hardware and software
    procurement and resource allocations.

    Manage and track work progress by working with contracting
    officer technical representatives to ensure that work
    performed is consistent with the goals of the Center
    and the NWS modernization.

Ensure that short-term development activities are compatible with the long-term goals of the Project.

The development process involves the users from the beginning in the definition of requirements for the workstations. Common software elements of the workstation can be identified so they need only be developed once in a generic way that will allow support of a wide range of functions. A Functional Requirements and System Design Document for each Division/Center is an important first step.

The primary elements of the workstation include data flow, data access, data display, analysis and diagnostic routines, product generation, product launch and track and user interface tools. These elements of a phased development, which meet requirements set by iterative procedures and reviewed by an NMC review team, will be the main body of work for the NWF. A short description of each element follows:

1)   Data Flow. The reliable and timely flow of data
      is critical to the success of the Project. The data
      must be accessible on all workstations. There are four
      main sources of data that are required; data from the
      front end machines, data from the Cray, satellite data
      (imagery and products) from systems currently in use
      and from NESDIS central processing, and raw bulletin
      data.

2)   Data access. A common set of data access routines will
      be developed to isolate applications programs from the
      format of the data. This will allow applications
      programs to always receive the data in the same format,
      which is independent of the way the data are stored.
      This is important for several reasons. One is the
      variety of formats that currently exist for different
      data sets. Another reason to isolate the data access
      routines is to aid in the eventual implementation of a
      commercial relational database management system
      (RDBMS). RDBMS routines could replace the data access
      layer without making changes to applications programs.
      This will give NMC the flexibility to change data
      formats without making major software changes to
      applications programs.

3)   Data display. A common aspect of the workstation
      design is that all workstations will display data.
      This element includes such things as plotting surface
      and upper air data, and drawing contours from gridded
      data sets. The data display functions will be
      implemented in a hardware independent way,
      standardizing on X-Windows. Standard routines will be
      developed for the use and manipulation of bit planes,
      and a standard set of functions such as zoom,

174

animation, enhancement, and pan capabilities will be developed. Data display also includes the capability to print these data sets.

4) <u>Analysis and diagnostic routines</u>. Another element of the workstation is the ability to analyze data and perform diagnostic functions. These include a variety of functions such as objective analysis routines, the calculation of derived parameters either at a point or for a field, and the creation of cross sections or time sections and 3 dimensional animated analysis of many derived quantities resulting from model run data. Within this element, a large set of meteorological programs already exist. A well documented and generic set of subroutines for analyzing meteorological data will be integrated into the workstation.

5) <u>Product generation</u>. One item that is important to the efficiency of NMC's operation is the ability to generate products on the workstations. The goal is to allow the forecasters to create products directly on workstations, and avoid the resource intensive step of entering the forecasts into the computer after the products are created. A complete, integrated display and product generation system will be developed.

6) <u>Product launch and track</u>. The product launch and track is another important workstation element. When products are issued, there will be an indication at the workstation that the product was successfully sent, and reached its intended destination. This is important to allow the forecasters to concentrate on meteorology, rather than the mechanics of monitoring the product's communications. It is also important to the success of NMC, since NMC often finds out that products were not received only when calls alert us to the problem. The tracking of products to the weather service forecast offices will likely be an NMC function.

7) <u>User interface</u>. An efficient and flexible user interface is critical to the success of the system. It will allow a point and shoot selection of products and combinations of displays and permit system use without a significant amount of training. It will also help to maintain a consistent look and feel to the workstations as they are used in different parts of the Center.

The issues and actions pertaining to meteorological workstations described herein are under consideration at other meteorological centers. The sharing of information between centers is increasing and many of the ideas suggested at the workshop are coming into wide acceptance by the meteorological community. For example, the use of BUFR and GRIB data formats in the communication of

digital information. The NMC goal and that of the meteorological
community is to avoid the fragmentation of activates that derive
from our organizational structures. We believe that the WDP will
accomplish this goal.