NCEP Class VIII Computing System Acquisition

Project Agreement
for
The Acquisition of the
Class VIII Computing System
for
The National Centers for Environmental Prediction

October 10, 1997

I. Background and Purpose

The National Centers for Environmental Prediction (NCEP) seeks to acquire an upgrade to the capabilities of its current high-end operational computer system in 1998. The desired new system (the Class VIII system) will replace the current NCEP supercomputer and will function as the centerpiece of the computing and communications system used for predictive environmental modeling within the National Oceanic and Atmospheric Administration (NOAA). The Class VIII system will be used at NCEP to assimilate the data which are the foundation for operational environmental modeling and to execute the numerical models which form the basis for all routine environmental forecasts, public and private, produced in the United States.

The need to upgrade the NCEP supercomputer is identified in the current NOAA Strategic Plan and is essential to achieve NOAA's strategic goal to "Advance Short-Term Warnings and Forecast Services". This upgrade is also critical to the attainment of the NOAA strategic goal to "Implement Seasonal to Interannual Climate Forecasts". Many specific environmental modeling and forecast goals for the years 1999 through 2003, as identified in the current NOAA Operational IT Plan, are dependent upon the timely acquisition of the Class VIII system.

Within the National Weather Service (NWS) the NCEP Class VIII system is one of the technology components of the Modernization and Associated Restructuring program. This program was designed to apply modern technology to environmental forecasting problems and to streamline the NWS forecast process and is described in the *Strategic Plan for the Modernization and Associated Restructuring of the National Weather Service*.

The role of the Class VIII system is more fully described in a number of NCEP documents. One of these is the current NCEP Information Technology Plan,

Requirements Analysis number NA-W-WD-95-01, which describes organization-wide plans for computing at NCEP.

In order to fulfill the objective of acquiring a Class VIII system in 1998, NCEP will utilize the Department of Commerce's re-engineered acquisition process termed CONOPS. That process is described in a document entitled *Department of Commerce Acquisition Process Case for Change*. The intent of the new process is to create an improved acquisition environment which will benefit both the vendor community and the Government. In order to successfully implement this new process the Government seeks the cooperation of the vendor community in an effort to conduct business in an atmosphere of integrity, openness, and fairness.

This Project Agreement establishes an agreement between the Class VIII Acquisition Team (the project team) and the senior management of the National Weather Service. The agreement empowers the project team to research, acquire, deploy, and monitor the systems and services that comprise the Class VIII system. The Project Agreement outlines the objectives of the project, project team duties, budget availability, and the high-level milestones for the accomplishment of these project objectives.

II. Authority

This project is hereby authorized by the Acting Assistant Administrator for Weather Services and the Director of the National Centers for Environmental Prediction. It is identified as a requirement of NCEP, the organization tasked with operating state-of-the-art computer systems to execute prediction models in support of the Nation's environmental forecasting program.

The Class VIII acquisition undertaken by this project will require a Delegation of Procurement Authority from the Department of Commerce, Office of Budget, Management and Information.

III. Project Objective

The project team will secure a Class VIII computing system for the National Centers for Environmental Prediction. This system must be operational prior to March, 1999 when the support contract for the current system ends. The new system will be installed in Building 28 at the Goddard Space Flight Center in Greenbelt, Maryland.

NCEP has in the past replaced its high-end systems on a five-year cycle. One of the objectives of this project is to more effectively maintain currency in the rapidly evolving technology which comprises such systems. As demonstrated in the NCEP Class VIII High-Performance Computer Acquisition Cost/Benefit Analysis, it is possible to increase the overall computing capacity of NCEP supercomputer systems and to do so with improved cost effectiveness by reducing the replacement cycle for these systems to three years. Accordingly, it is anticipated that a system intended to replace the system acquired through this project will be procured three years after the Class VIII is accepted.

Another method by which the project team will help to ensure that the Class VIII system efficiently delivers as much computational capacity as possible is to evaluate its performance annually. The annual review process will include a consideration of how to best achieve graduated performance goals via mid-life system enhancements intended to foster continued cost effective operations.

The field of Numerical Weather Prediction is scientifically exciting today as the accuracy of environmental forecast models approaches levels undreamed of ten years ago. Higher resolution models with improved physics will enable the NWS to produce forecasts with better spatial resolution and valid at longer time scales than ever before. These expanded models are computationally demanding and require very robust capabilities in order to execute within a fixed time window of short duration. Therefore, the primary project objective is to secure the maximum level of performance possible within the constraints of the budget. The minimum acceptable

performance is a system that is at least five times faster than the current NCEP high-end system.

The NCEP Class VIII system is more than simply a high-speed computer. It includes additional hardware (storage devices, communications interfaces, and other peripherals), software (primarily, but not limited to, the operating system and compilers), full system maintenance, and support services. This system comprises the core computational resource for the Numerical Weather Prediction efforts of the National Weather Service. This operational system provides essential governmental services and, therefore, a second key objective of the project team is to obtain a system with a very high level of reliability and availability.

IV. Approach

This project will follow the general approach and guidelines established during the CONOPS pilot studies conducted in 1996 and 1997. This will speed the exchange of information, help assure equal opportunity for all respondents and encourage openness by making as much information as possible available simultaneously to all parties. It is intended to meet the Government's need for computing capabilities by contracting with the private sector. This process makes use of market research to help determine an acquisition strategy and to refine the Government's requirements in relation to the capabilities and approaches of the private sector.

To promote an equitable and active dialog with all members of private industry who may be interested in responding to the stated needs of the Government, electronic communications will be used extensively throughout this solicitation process. This will speed the exchange of information and help assure equal opportunity for all respondents, and is intended to encourage openness by making as much information as possible available simultaneously to all parties. This Project Agreement and the solicitation documents that result from the work of the project team will be posted publicly on the Internet.

V. Members

The Class VIII Acquisition Team consists of a core group which provides the steering and decision-making authority for the project. This group is augmented by associates and consultants from several parts of the Department of Commerce. The team is headed by a project team leader who has overall authority and responsibility for the successful accomplishment of the project objective and fulfillment of the terms of this Project Agreement. The selection and assignment of other team members has been made on the basis of cross-functional needs and includes a warranted procurement official, a procurement specialist, program representatives, an information technology analyst, a budget analyst, a legal representative, and project advisors.

VI. Empowerment and Management Review

The project team is hereby authorized to take all steps necessary for the acquisition of the NCEP Class VIII computer system, including related hardware, software, and support services. Subject to the Delegation of Procurement Authority as noted in Section II, the project team has complete acquisition authority and source selection authority. No authorizations other than those already obtained or described in this agreement will be required. This is critical in order to maintain the aggressive schedule necessary for this acquisition.

The project team is empowered to conduct any acquisitions necessary to support the Class VIII procurement. This includes complete authority to conduct micro purchases, purchase card acquisitions, and contracting by other methods, within the budgetary limits and within the project scope described in the Project Agreement. All contracts will be executed by a warranted Contracting Officer who is a member of the project team.

The project team will fulfill its responsibilities with respect to management oversight by conducting briefings immediately prior to the following actions:

1. release of solicitation and statement of need,

2. award decision,

3. system acceptance,

4. system fully operational.

In addition to the project team conducting briefings for management prior to the actions noted above, briefings on the status of the acquisition process will be provided by the project team leader more frequently, e.g. approximately monthly. The briefings will include a review of project milestones, an update of the state of the budget supporting the Class VIII system, and an assessment of the status of the goals and objectives of the project. The briefings will also provide a forum to raise and address other issues which the project team feels might be of interest to those providing management oversight. Finally, the briefings will afford managers the opportunity to raise questions or topics which they believe the project team should address.

It is the intent of the parties to this Project Agreement that except under unusual circumstances no additional reviews or documentation will be required. The project team includes oversight advisors who will participate throughout the acquisition process and that on-going interaction will serve in lieu of reviews and clearances by the Office of Acquisition Management, the Office of Budget and Management Information, NOAA, and the NWS.

The following planning documents form the basis for the activities of this project and they will be provided publicly:

NOAA Strategic Plan;

NOAA Operational IT Plan;

Strategic Plan for the Modernization and Associated Restructuring of the National Weather Service;

NCEP Information Technology Plan, NA-W-WD-95-01; and

NCEP Class VIII High-Performance Computer Acquisition (Cost/Benefit Analysis).

The following documents will also be provided publicly by the project team during the course of this acquisition:

Project Agreement

Solicitation, including Statement of Need

While protecting vendor confidentiality, management will have complete access to the Internet facilities maintained by the project team. In addition, management will be granted access upon request to procurement sensitive documents maintained on a secure intranet. The Internet and intranet facilities together will contain the most recent drafts of all pertinent documents. The project team will inform management of significant deviations from the acquisition milestones that may affect the planned award date (March, 1998) or the date by which the system will become fully operational (February, 1999).

VII. Estimated Value

The total value of the Class VIII Acquisition project is estimated to be $35,800,000. This represents a planning level approved by NOAA and the Department of Commerce, but not yet approved by the Office of Management and Budget. Funding is planned over a four-year period covering fiscal years 1999 through 2002 and will be provided through the appropriation process annually, subject to the availability of funds. This level of funding is intended to acquire an appropriate computer system,

including all system maintenance, support, and mid-life system enhancements, with acquisition costs spread evenly over a three-year period (fiscal years 1999 through 2001); and to operate that system over a four-year life cycle (fiscal years 1999 through 2002). The following is the annual breakdown of the funding planned for this acquisition.

	FY 1999	FY 2000	FY 2001	FY 2002
Equipment Acquisition	$10.0	$10.0	$10.0	---
Maintenance and Support	1.6	1.6	1.6	$1.0
	(Dollars in millions)			

VIII. Milestones

The overarching goal of this project is to take all steps necessary to provide for the timely acquisition and continued availability of the NCEP Class VIII system, including related hardware, software, and support services. To ensure that the capabilities of this system will be available when needed, the project team plans to award the Class VIII contract in March, 1998. This contract will call for the subsequent installation of a system in July, 1998. Acceptance of that system is scheduled to occur in October, 1998, after which time the operational use of the system will begin.

The following milestones present an overview of the project schedule.

Approve Project Agreement	October, 1997
Issue CBD RFI announcement	October, 1997
Release draft Statement of Need	October, 1997
Release initial benchmark codes	October, 1997
Conduct market research and initiate dialog with vendors	October, 1997
Issue CBD RFP announcement	November, 1997
Release final benchmark codes	November, 1997
Issue RFP	December, 1997
Receive vendor proposals	January, 1998
Award contract	March, 1998
Deliver system to the Goddard site	June, 1998
Install system, begin testing	July, 1998
Accept system	October, 1998
Initiate operations and transition activities	October, 1998
System fully operational	February, 1999
Annual system performance review	October, 1999
Annual system performance review	October, 2000
Annual system performance review	October, 2001

IX. Term

The project begins at the date of the approval of this document and concludes when the Class VIII system is removed from operations. The system life is projected to be four years. The final year of operation for this system will overlap with the first year of

operation for a successor system.

X. Performance Goals and Measures

This project activity has clearly defined performance requirements as well as fiscal and temporal constraints. The project team intends to acquire the best supercomputer system available for the budgeted level of funding and to do so in a way that accommodates the termination of the use of the current supercomputer in February, 1999. Maintaining the acquisition schedule described herein, which is designed to support the withdrawal of the current system from operations at the completion of the existing contract, while at the same time providing adequate computational resources is the highest priority for the project team.

In order to meet NCEP's performance requirements, the computational capacity of proposed Class VIII systems will be measured by carefully reviewing demonstrated performance on a suite of NCEP benchmark programs. Once the Class VIII system is installed and operational, the project team will ensure the continuing acceptability of the Class VIII system and verify that its utilization supports all pertinent operational schedules and appropriate scientific goals.

Performance monitoring during the life of the system will be continuous. System availability of not less than 96 per cent has been the historical goal for high-end systems at NCEP and this system will meet or exceed that requirement.

During the life of the Class VIII system, the project team will conduct annual reviews of the system in order to consider its performance and to evaluate opportunities for extending its capabilities. System upgrades must be available within the initial budget constraints of this acquisition and the review process which will result in decisions on how best to enhance overall performance will begin within one year of system acceptance.

The Class VIII system must offer sufficient capacity to support the necessary activities of the Environmental Modeling Center and other legitimate user groups in addition to the execution of operational numerical models and other mission-critical applications.

The following table, submitted as a portion of the 1997 NOAA Operational IT Plan, summarizes some pertinent operational performance measures. Those for fiscal years 1999 and beyond are explicitly dependent upon the timely acquisition of the Class VIII system and so are most appropriate for this Project Agreement.

Performance Measures

Measure	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02	FY 03
Hurricane Prediction System							
24hr Position Accuracy (km)	145	140	135	130	130	125	125
Mesoscale Prediction System							
24hr 1" Precipitation Skill Score	.22	.24	.26	.27	.28	.29	.30
Short-Range Ensemble Forecasting System							
24hr 1" Precipitation Skill Score	.19	.21	.23	.24	.25	.26	.27
Global Prediction System							
24hr Aviation Wind Error (m/s)	7.0	6.5	6.0	5.6	5.3	5.0	4.8
Coupled Ocean-Atmosphere ENSO Forecast Model							
6-month lead NINO3.4 SSTa AC score (5yr running average)	0.65	0.65	0.70	0.70	0.75	0.75	0.80

The shaded entries here are those directly dependent upon the availability of the computational capacity and performance of the Class VIII system.

The statistics used to measure performance in the table above require some explanation. In the case of the hurricane prediction system, 24-hour position accuracy refers to the difference between the actual and 24-hour forecast positions of the centers of hurricanes or other tropical storms as measured in kilometers. The

table shows that the amount of error for such forecasts should be less than 130 kilometers in the year 2000.

Quantitative precipitation forecasting is one of the most demanding forecast problems routinely addressed by the NWS. The accuracy of such forecasts is measured using skill scores for the occurrence of precipitation which exceeds a particular threshold value. In the case of both the mesoscale prediction system and the short-range ensemble forecasting system, the table reflects a measure of forecast skill against a threshold value of one inch. The skill score is a statistic derived by comparing forecast and observed areas for the event of interest, here the occurrence of greater than one inch of precipitation. A perfect forecast would yield a skill score of 1.00, whereas a forecast that is completely erroneous would result in a skill score of 0.00. The figures in the table for the mesoscale prediction system and the short-range ensemble forecasting system indicate an expectation of an increase in forecast skill of about 25 per cent between 1997 and 2000.

The indicated performance measure for the global prediction system is the mean difference between the actual and 24-hour forecast of wind velocity at approximately 34,000 feet above the surface of the earth as measured in meters per second. The table shows that the average world-wide error of such forecasts should be not higher than 6.0 meters per second in 1999.

The final measure in the table relates the performance of the coupled model to the occurrence of El Nino-Southern Oscillation (ENSO) events. This is a subtle forecast problem and the measure of the degree to which these events can be successfully predicted is accordingly complex. ENSO events are typically measured by the magnitude of the departure from climatological norms for sea surface temperatures within a given index area in the equatorial Pacific ocean. The official index area that NCEP uses to define El Nino occurrences and within which it measures forecast skill is the region from 120 to 170 degrees west longitude and between 5 degrees north and 5 degrees south latitude. This region is known as Nino3.4. The indicated performance measure for the coupled ENSO model is the correlation of the Nino3.4 sea surface temperature anomalies (SSTa) comparing current observations with forecasts made 6-month prior to those occurrences, as averaged over a 5-year period. The table indicates the skill for El Nino forecasts with a 6-month lead time for the period from 1997 to 2001 should reach 0.75. That amounts to approximately a 15 per cent increase in the level of skill of the coupled model according to this statistical measure.

Execution

Signed October 15, 1997

_____ _____

Wayman E. Baker Date

Project Team Leader, Acting Director of NCEP Central Operations

Signed October 15, 1997

_____ _____

Robert S. Winokur Date

Acting Assistant Administrator for Weather Services

Signed October 15, 1997

_____ _____

Ronald D. McPherson Date

Director, National Centers for Environmental Prediction

DOC Home NOAA Home NWS Home NCEP Home

Last Modified: January 24, 2000