

**National Oceanic and Atmospheric Administration  
National Weather Service  
Telecommunication Gateway (NWSTG)  
006-48-01-12-01-3106-00  
Operational Analysis  
2008**

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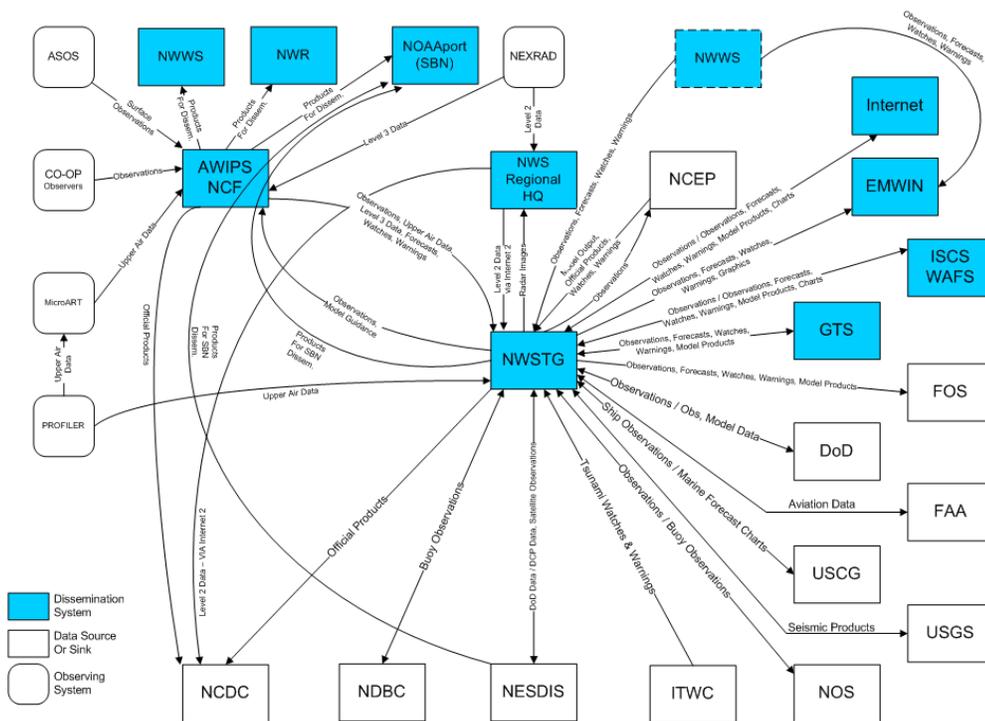
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**Executive Summary**

NOAA’s National Weather Service Telecommunication Gateway (NWSTG) consists of the NWSTG primary message switching system in Silver Spring, MD and the backup message switching system in Mount Weather, VA. The NWSTG is a critical element allowing NWS to satisfy the requirements for collection and distribution of hydro meteorological data. The NWSTG allows the NWS and its partners - public, private, and commercial - to perform their core functions. The NWSTG supports the NWS mission by collecting and distributing raw and processed hydro meteorological data and products. The National Weather Service Telecommunication Gateway (NWSTG) interfaces with a wide variety of partners and customers. All observational data ingested by the NWS passes through the NWSTG. The NWSTG acts as a message switch and routes these products to meet our customer’s requirements. The NWS CIO/Telecommunication Operations Center (TOC) operates and maintains the NWSTG.

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NWS Data Flow – NWSTG-centric View  
 OCIO – Darling – 15 March 2005



This report focuses on the operational state of the program as of September 30, 2008 and is based on guidance developed by the Department of Commerce. The NWSTG program directly facilitates NOAA’s Strategic Goal to “Serve society’s needs for weather and water information”. The current program meets established cost, schedule and performance parameters.

This operational analysis (OA) is an annual, in-depth review of the program’s performance based on the following:

- Customer Results
- Strategic and Business Results
- Financial Performance
- Innovation

## **1.0 Customer Results**

The NWSTG impacts all economic sectors of the nation and is instrumental in the collection and distribution of weather and climate data critical to general public safety as well as the nation's economic well-being. Customers include the aviation, energy, and private weather forecasting industry sectors and the general public. The nation is a stakeholder; other customers include federal agencies as DoD, FAA, NASA, state and local governments, and academia. Additionally, the NWSTG is a global acquirer and distributor of weather messages in support of the NWS commitment to the WMO World-Wide data exchange.

### **1.1 Customer Requirements and Costs**

The principal internal customers are the NWS forecast offices and national centers which rely on the timely and dependable flow of observations, guidance and forecast products through the NWSTG. The principal external customers and stakeholders are other government agencies, the private sector, the public, and the global community. The NWSTG supports customer requirements through the timely dissemination of data delivered by customers to the NWSTG.

Through conferences, seminars, stakeholder meetings and other venues the TOC seeks to establish and develop effective dialogue with users to identify, document and prioritize requirements of major stakeholders for current and future NWSTG services and to identify mechanism(s) to review and update these requirements. User conferences attended by NWSTG representatives in FY2008 include:

APSDEU Oct 9-12 2007

PCSC Australia Nov 12-16 2007

WMO Implementation-Coordination Meeting on the Improved Main Telecommunication Network (ICM-IMTN), Nov 27-29, 2008, Silver Spring, MD

WMO Executive Council Working Group on WIGOS-WIS (EC-WIGOS-WIS), Dec 4-7, 2008, Geneva, Switzerland

AMS/FOS plus International and Partners Meetings Jan 17-24, 2008, New Orleans, LA

WMO Expert Team on the Assessment of Data Representation Systems (ET-ADRS), April 23-25, 2008, Silver Spring, MD

WMO RA-IV & Hurricane Conference April 23-28, 2008, Orlando, FL

NWS Partners Meeting June 8 2008, Silver Spring, MD

WMO Inter-commission Coordination Group on the WMO Information System (ICG\_WIS) July 14-17 2008, Brasilia, Brazil

WMO Commission for Basic Systems Codes Meeting Sep 1-5 2008, Geneva, Switzerland

~~21st North American Europe Data Exchange (NAEDEX) Meeting Sep 17-19, 2008, Asheville, NC~~

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WMO Inter-commission Meeting on the Global Telecommunication System and the WMO Information System and the Expert Team on Operational Implementation (ICM-GTS/WIS & ET-OI), Sep 23-26, 2008 Geneva, Switzerland

## 1.2 Performance Measures

Several key system level performance measures are tracked on a regular basis to determine the effectiveness of the program. Key performance measures are: (1) System Availability, (2) Warning Message Latency, (3) Routine Message Latency, and (4) Traffic Volume. For Message Latency, Thruput Circuit Analysis is conducted for a 24 hour period on representative lines to produce average message latency from edge to edge of the message switch. System Availability is measured monthly as the percentage of the total hours for the month that NWSSTG services were available to any of the four major customer sectors: NCEP, AWIPS, Government (DoD, FAA, etc.), and Family of Services. Non-availability is considered as loss of NWSSTG services to all four major customer sectors due to unplanned or planned downtime.

These measures align with the “Customer Results Measurement Area” of the Performance Reference Model developed by the Federal Enterprise Architecture Program Management Office (FEA-PMO). Table 1 summarizes the performance measures.

**Table 1: Customer Results Performance Measure**

Measurement Area	Indicator	2006 Baseline	2007 Actual Result	FY2008 Actual Result	Comments
Customer Requirements	System Availability	99.99	100%	99.93%	
	Warning Message Latency	10 seconds	.75 sec	.71 sec	
	Routine Message Latency	60 seconds	.75 sec	.71 sec	
	Daily Traffic Volume	1.2TB	1.4TB	1.46TB	

## 2.0 Strategic and Business Results

The NWSSTG program is meeting its own goals and objectives as well as those of the agency. Program management and controls are in place to ensure the program continues to meet its goals and objectives and monitor how well the NWSSTG program performs.

The latest performance data, as of September 30, 2008, show the NWSSTG is meeting or exceeding all of its performance goals. The extraordinarily high system availability performance is attributable

to the high level of redundancy within the core infrastructure and the fact that the key NWSTG functions are segregated in terms of data paths and server platforms so that the more likely result of a malfunction is degradation in overall NWSTG service rather than a total outage. This robustness is likely to decrease as the ongoing transition from diverse point-to-point circuits to a network centric topology converges data paths on to common platforms. However, this vulnerability will be negated to a large degree by the availability of the NWSTG Backup System. Moreover, non-availability due to scheduled downtimes for maintenance can be reduced since operations can be transferred between the primary and backup systems to accommodate many maintenance requirements. The NWSTG Backup System has completed operational testing to demonstrate its ability to meet the same operational and performance criteria as the NWSTG. As customers modify their connectivity to connect to the network centric topology, they will acquire the catastrophic backup provided by the NWSTG Backup System while those not having done so remain dependent on the viability of the network access router at the NWSTG. This transition is the customer's responsibility and it is progressing at an exceedingly slow pace. A letter has been written for the Assistant Administrator for Weather Services signature which will set a deadline for all connections to NOAA net for NWSTG Backup System access. The letter is currently undergoing final review within NWS CIO.

## 2.1 NWSTG Helps to Achieve Strategic Goals

This is covered in two sections. The first section relates how the NWSTG and NWSTG Backup support NOAA strategic goals. The second section provides specific examples of products transiting the NWSTG with a critical time factor.

### NOAA Strategic Goals

Supports NOAA Mission Goal 3: Serve Society's Needs for Weather and Water Information

- Performance Objective: Increase application and accessibility of weather and water information as the foundation for creating and leveraging public (i.e., federal, state, local, tribal), private and academic partnerships.
- Performance Objective: Increase coordination of weather and water information and services with integration of local, regional, and global observation systems.
- Outcome: Better, quicker, and more valuable weather and water information to support improved decisions.
- Outcome: Increased customer satisfaction with weather and water information and services.

The NWSTG is the major NOAA hub for acquisition, interconnectivity and dissemination between weather, climate and water data systems, telecommunication networks and information producers. The reliability and timeliness of data communication services through the NWSTG is critical to the U.S. weather enterprise, including direct support to our partners in the private sector, academia, and government who help disseminate critical environmental information. The improved message transit times and catastrophic backup capability resulting from the recent NWSTG replacement and the impending NWSTG Backup directly contribute to the desired outcomes for quicker weather and water

information and increased customer satisfaction. Severe weather warnings will be delivered quicker to state emergency managers via Emergency Managers Weather Information Network (EMWIN)) and to ships at sea via Global Maritime Distress and Safety System (GMDSS). The NWSTG improvements will accelerate delivery of products ranging from Earthquake and Avalanche Warnings, to Hazardous Materials and Radiological Hazard Warnings to the Department of Homeland Security via the HazCollect system.

Supports NOAA Mission Goal 4: Support the nation's commerce with information for safe, efficient, and environmentally sound transportation

- Performance Objective: Enhance navigational safety and efficiency by improving information products and services.
- Performance Objective: Reduce human risk, environmental, and economic consequences resulting from natural or human induced emergencies.
- Outcome: Safe, secure, efficient, and seamless movement of goods and people in the U.S. transportation system.

The NWSTG provides the primary path for delivery of airport forecasts and aviation support products including aviation model data to the Federal Aviation Administration and to the Airlines themselves. The NWSTG provides the data streams to feed the International Civil Aviation Organization World Area Forecast System, a global satellite-based aviation support system. It also is an Operational Meteorology Databank for the Aeronautical Fixed Telecommunication Network. The NWSTG collects data from and provides data to the maritime community including Service Argos and the GMDSS. The NWSTG also supports data needs for national and local surface transportation requirements. The improved message transit times and catastrophic backup capability resulting from the recent NWSTG replacement and the impending NWSTG Backup enhance the timeliness and reliability of data delivery to the U.S. transportation system and, therefore, directly contribute to the desired outcome for safe, secure, efficient, and seamless movement of goods and people in the U.S. transportation system.

Supports NOAA Mission Goal 5: Provide critical support for NOAA's mission

- Performance Objective: Enhance applicability of NOAA services to homeland security efforts.
- Performance Objective: Increase quantity, quality, and accuracy of satellite data that are processed and distributed within targeted time.
- Performance Objective: Increase internal and external availability, reliability, security, and use of NOAA information technology and services.
- Outcome: A safe operating environment with efficient and effective financial, administrative, and support services.
- Outcome: Ship, aircraft, and satellite programs that ensure continuous observation of critical environmental conditions.
- Outcome: NOAA homeland security-related capabilities that are fully integrated into national planning and available at all times.
- Outcome: Secure, reliable, and robust information flows within NOAA and out to the public.

The NWSTG allows for a high speed line interface to satisfy DHS data requirements. The NWSTG provides for dissemination of Civil Emergency Management messages

including alerts from DHS. The NWSTG provides distribution of satellite data from NESDIS and other satellite data providers. The NWSTG is absolutely critical to meet the requirements for increased quantity, quality, accuracy, timeliness and reliability for data and information flow to support NOAA, national and International missions.

#### Specific examples of time critical products

##### Products benefiting directly from reduction in NWSTG latency

- Observation delivery to WFOs to support forecast process such as tornado observations from non-NOAA sources.
- Observation delivery to FAA to support flight service
- Observation delivery to Lightning data delivery to field
- Hazcollect message delivery to field for NOAA Weather Radio All Hazards dissemination
- Tsunami/Seismic data delivery to EMWIN and GTS
- Fire Weather Forecast dissemination to SPOT and Department of Interior
- Radar imagery dissemination to public, NWS regional headquarters, and emergency managers
- Economic benefit derived by quicker delivery of data to commercial entities
- Hydrologic data delivery to RFCs/WFOs to support flood and flash flood watches and warnings

##### Products delivered exclusively through NWSTG

- Receipt and delivery of watch, warning, observation and forecast data to other federal and state agencies
- Acquisition and dissemination of international observations, forecasts and warnings
- International model output products such JMA and ECMWF

Products requiring periodic and punctual availability delivered through NWSTG. These are impacted any time the NWSTG develops a backlog of operations to perform.

- Observations to DoD to support model runs and operations
- ~~Data availability requirements control initiation of some NCEP jobs and affect the output~~ quality of others. The NCEP model begins to deteriorate immediately when observations are not received and becomes unusable within 24 hours
- Products issued by field offices such as the hourly weather roundup require observations to be delivered by certain times.
- The FAA requires certain forecasts to be available by critical times for aviation support.
- Products issued by Canadian agencies are highly dependent on receipt of U.S. data especially data near the border

**Deleted:** Data availability requirements control initiation of some NCEP jobs and affects

## 2.2 Business Results

### 2.2.1 Program Management and Controls

At the NOAA level, the NOAA's Program Planning and Integration (PPI) and Program, Analysis and Evaluation (PA&E) offices provide management oversight using the Planning-Programming-

Budgeting-Execution (PPBES) process. At the NWS level, the Chief Information Officer provides management oversight for the NWSTG and accepted Project Management practices are applied to monitor progress and control costs and resources. At the program level, work progress is rigorously tracked against established milestones and success criteria.

### 2.2.2 Monitoring Cost, Schedule and Performance

Cost – Budget reviews are conducted weekly as part of the TOC Program Review

Schedule – Project schedules are updated and reviewed weekly as part of the TOC Program Review

Performance – Project performance reviews are conducted weekly as part of the TOC Program Review. Monthly quad charts for major investments are prepared for the NWS CFO to track Cost, Schedule, and Performance and alert NWS Senior Management to issues, risks and mitigation strategies.

### 2.3 Reviews

NITRB Post Implementation Review – August 14, 2007  
 CITRB Post Implementation Review – September 26, 2007  
 Weekly TOC Program Review

### 2.4 Security

The NWS Telecommunication Gateway system is accredited under requirements spelled out in NOAA Administrative Order 212-13 (03/17/03) and NOAA Information Technology Security Manual (05/15/2007) that are based on OMB and NIST guidance. System Security Plans, Risk Assessments, and Contingency Plans were certified and approved for the NWS Telecommunication Gateway system on 03/22/2007. Management, operational, and technical security controls are adequate to ensure the confidentiality, integrity and availability of information.

### 2.5 Performance Measures

The performance measures in Table 2 show the NWSTG’s performance with respect to Strategic and Business Results. Strategic and Business Results performance measures introduced in 2007 include network access, systems control, and product delivery. These measures align with the “Mission and Business Results Measurement Area,” “Processes and Activities Measurement Area” and the “Technology Measurement Area” of the Performance Reference Model developed by the Federal Enterprise Architecture - PMO.

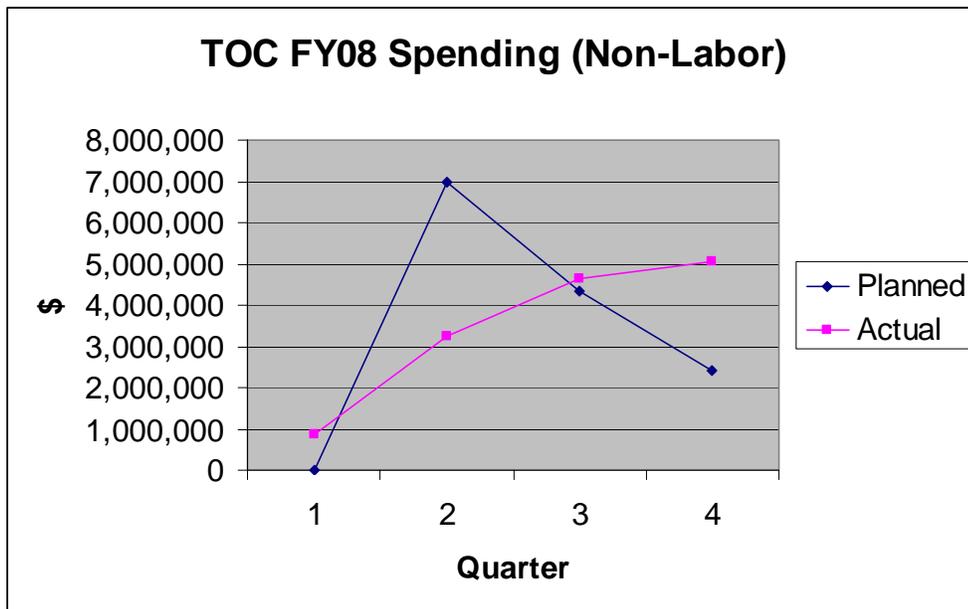
Fiscal Year	Strategic Goal(s) Supported	Measurement Area	Measurement Category	Measurement Grouping	Measurement Indicator	Baseline	Target	Actual Results
2008	3.1 Advance understanding and predict	Customer Results	Timeliness and Responsiveness	Response Time	timeliness of response to customer service	customer is contacted by appropriate staff	customer is contacted by appropriate staff	Response times are consistently within the target

Fiscal Year	Strategic Goal(s) Supported	Measurement Area	Measurement Category	Measurement Grouping	Measurement Indicator	Baseline	Target	Actual Results
	changes in the Earth's environment to meet America's economic, social, and environmental needs.				requests	resource within 60 minutes of initial customer request for service (non-emergency)	resource within 50 minutes of initial customer request for service (non-emergency)	parameters
2008	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Mission and Business Results	Internal Risk Management and Mitigation	Contingency Planning	Currency and Accuracy of NWSWG Contingency Plan	Contingency plan updated annually	Review and update contingency plan on a quarterly basis	The contingency plan was updated in May 2008 to reflect results of COOP testing
2008	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Processes and Activities	Quality	Access	Sustained performance while increasing data throughput volume	Performance decreases as data throughput volume increases	Although timeliness goals will not increase, throughput capacity increases are designed into the system. Target is to accommodate increases dependent on outside sources of data with no impact on performance.	Performance has remained within target parameters
2008	3.1 Advance understanding and predict changes in the Earth's environment to meet America's economic, social, and environmental needs.	Technology	Effectiveness	IT Contribution to Process, Customer, or Mission	Reduce the number of servers beyond recommended life cycle to 15%	42% of servers beyond recommended life cycle	27% increase in number of servers within recommended life cycle	Target not achieved. Migration of core message switch to upgraded platforms (IBM p595) in progress but will not be completed until 2Q FY2009.

2.6 [Other]

3.0 Financial Performance

3.1 Current Performance vs. Baseline



**Telecommunications Operations Center Budget Profile**

(\$K)	FY07	FY08	FY09	FY10	FY11
<b>CAPABILITY:</b>					
DME	0	0	0	0	0
SS (Steady State)*	21,681	22,388	22,388	22,388	22,388
<b>Total</b>	<b>20,961</b>	<b>21,058</b>	<b>21,058</b>	<b>21,058</b>	<b>21,058</b>

*\*includes Legacy System Replacement PAC funding*

	FY07	FY08	FY09	FY10	FY11
<b>IT COMPONENTS:</b>					
Hardware	916	1,642	500	500	400
Software	100	100	100	100	100
Support Services	3,233	950	850	850	850
Telecommunications	6,274	8,368	9,176	9,156	9,331
IT Security	668	1,004	1,004	1,004	1,004
IT Training	23	30	30	30	30
Operations & Maintenance	2,323	1,908	1,991	1,871	1,850
Facility Infrastructure Refresh	105	347	698	838	784
<b>Subtotal</b>	<b>13,642</b>	<b>14,349</b>	<b>14,349</b>	<b>14,349</b>	<b>14,349</b>

	FY07	FY08	FY09	FY10	FY11
<b>FULL TIME EQUIVALENTS:</b>					
NWSTG Steady State	7,319	6,709	6,709	6,709	6,709
<b>Subtotal</b>	<b>7,319</b>	<b>6,709</b>	<b>6,709</b>	<b>6,709</b>	<b>6,709</b>

<b>FY08 TG Spending Totals (non labor)</b> <b>(excludes NOAA Net, non TG telecom)</b>	
Support Services	2,524
Technical Refresh	0
Hardware	137
Software	45
O&M	1,693
Telecom	170
	<b>4,569</b>

## Figure 2: Budget vs Actual Costs

The CIO Telecommunications Operations Center (TOC) uses several systems to measure and track project cost and schedule.

a. Cost: CIO/TOC has oversight responsibility for the entire NWS O&M budget. The NWS CIO budget analyst coordinates budget planning and execution with the project/program managers and tracks funding commitments and obligations through the Commerce Financial Management System.

b. Schedule: Due to resource limitations and higher priorities, TOC was able to implement approximately 30% of the Release II software development scheduled for FY2008 for the IBM pSeries enterprise servers that comprise the NWS message switch engine. TOC is currently assessing the remaining Release II task requirements for relevance to the current NWS operations. TOC is currently implementing migration of the NWS core message switching system to newer generation platform servers to be completed in 2<sup>nd</sup> Quarter FY2009. The schedule status of these projects is reported to NWS senior management on a monthly basis via routine Major Investment Reviews. The NWS Backup System successfully completed operational testing in December 2007 and will progress to Full Operational Capability as NWS customers transition to the NOAA MPLS network that interconnects the NWS primary and backup systems. Project schedules are developed and tracked on Microsoft Project 2003 Professional.

An annual, recurring O&M investment (\$13.87M non-labor in FY 2008) sustains the current high system availability and excellent overall performance level. The budget increased by \$2.5M for FY 2007 and beyond to fund the NOAA MPLS network connectivity for the NWS. TOC also received an increase of \$700K annually starting in FY 2008 to fund the cyclical technical refresh required to sustain the availability and performance levels.

Deleted:

This investment was last reviewed by the Commerce IT Review Board (CITRB) in September of 2007 as a Post Implementation review. Cost, schedule, and performance were presented and generally well received at the CITRB briefing.

### 3.2 Performance Measures

Budget development and execution have been accomplished using PC-based spreadsheets (currently Microsoft Excel) linked to the NOAA financial management systems. These spreadsheets have been used to compare actual cost data to budget baselines and to make the required baseline adjustments for subsequent budget development cycles. Cost and financial data are monitored to identify discrepancies with the approved financial plan and to develop corrective actions. This data is also used to monitor contractor performance, contractor rate adjustments, support program/budget reviews, and to answer questions from NWS, NOAA, and DOC management, OMB and the Congress.

### **3.3 Cost Benefit Analysis**

No Cost Benefit Analysis was conducted for the NWSSTG during calendar year 2008

### **3.4 Financial Performance Review**

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, CORs and contract managers to ensure contracts are within cost and on schedule. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. A detailed review of work and priorities is undertaken if cost is significantly above base lined values. Also, any necessary corrective actions are also identified and implemented.

### **4.0 Innovation to Meet Future Customer Needs**

The Telecommunications Operations Center receives executive level guidance from the TOC Division Director, the Office of Climate, Water, and Weather Services (OCWWS), and the National Center for Environmental Prediction (NCEP). Further input is provided by WMO and ICAO who outline Data Management practices and standards for exchange of data and products.

Additionally, the TOC complies with the OMB requirements of Circular No. A-11, Planning, Budgeting, Acquisition, and Management of Capital Assets; NOAA's Planning, Programming, Budgeting, and Execution System (PPBES), and the NWS Operations and Services Improvement Process (OSIP). These combined processes ensures the NWSSTG O&M investment is exposed to a rigorous review and decision making process that assesses NWSSTG performance relative to its contributions to NOAA's strategic goals and that it continues to be a viable and necessary investment.

A dedicated TOC Project Manager (PM) position was created to oversee the NWSSTG project execution of the four TOC Branches so all IT related activities are interlinked and communicated throughout the TOC, NWS and International community. The next step is to create a Project Management Office (PMO) to consolidate the appropriate TOC resources under the PM so they may be effectively applied to project management. This organizational realignment was deferred pending selection of the new TOC Director. Now that the TOC Director position is filled, efforts will resume to establish the PMO in FY2009. Changes to the system either on the network, software or hardware side are controlled by a Configuration Management solution to document, archive and control all changes. A NWSSTG Change Control Board (CCB) reviews and rules on all change requests.

### **4.1 Number and Types of Users**

Project to Address Challenge: *Support growth in NCEP model output.*

The estimated volume of output from the NCEP models will grow exponentially in the next few years. The challenge is to have the capability to ingest this data from NCEP and make it available to our customer base as they require. This requires growth in our network storage capacity and our NOAAnet bandwidth requirements which can be added easily with additional funding. In addition

technical refresh and incremental computing growth can enable the NWSTG to process and route this additional data.

Project to Address Challenge: *Support requirements to ingest data from new sources.*

There are many new sources of observed environmental data that are becoming available from state and non-governmental sources. These data can be used by NCEP in the generation of the new forecast models to improve accuracy and reliability. The NWSTG is planning to ingest data from the MADIS system to obtain state Mesonet data along with other quality controlled miscellaneous observational data. Additional processing requirements should be met through technical refresh and incremental computing growth. In addition, operational support staff and monitoring tools may be required depending on support requirements.

## 4.2

Project to Address Challenge: *WMO Information System*

The NWSTG is required to support the World Meteorological Organization Information System (WIS). The WIS includes the legacy Global Telecommunication System (GTS), the satellite based Integrated Global Data Dissemination System (IGDDS) and is implementing an internet based data Discovery, Access and Retrieval (DAR) system which is designed around a series of catalogues which contain metadata describing what information and information access services exist within the WMO communities, what they contain, where they are and how to retrieve the required information. Synchronised copies of these catalogues, along with at least 24 hours of the entire set of WMO data and products available for routine global exchange, will reside in a series of Global Information and System Centres (GISC). As well as hosting the catalogues and information, the GISCs will collect and disseminate information from and to Data Collection or Production Centres (DCPC) and National Centres (NC) within its area of responsibility and distribute that information onto the other GISCs. The NWSTG may require an upgrade in computing resources, network storage and networking capability to meet the requirements of a GISC. Also, additional IT staff to support this expanded system could be required.

## 4.4 Funding Levels

The NWSTG Replacement and Backup Systems were designed with sufficient capacity and scalability to meet projected current user requirements through 2010. Additionally, the systems have the capability to double the current sustained message throughput. It is expected that new user requirements will be accompanied with adequate funding to implement and maintain the necessary capacity increases. The current NWSTG budget includes sufficient funding to support a technical refresh program which allows the NWSTG to stay abreast of the evolving technology.

## Annex A

1. Is the project bound by Memoranda of Understanding (MOU), international treaties, Service Level Agreements (SLA), or other agreements? If yes, please and describe below.

- The NWSTG supports global dissemination of weather data through international agreements under the auspices of the United Nations World Meteorological Organization
- Through Family of Services Agreements, the NWSTG provides external user access to U.S. Government obtained or derived weather information.
- The NWSTG exchanges data with the FAA and DoD in accordance with established MOUs

2. Name the management control processes. For example: Operational Monitoring, Daily Status Briefing, Weekly Status Meetings, Monthly Staff Meetings, Monthly Configuration Control Board, Monthly Budget Reviews, Working Groups, Program Steering Group, etc.

NWSTG Management Control Processes:

1. Ongoing real-time operational monitoring
2. Weekly Project Reviews (includes budget review)
3. Weekly Staff Meetings
4. Weekly Change Control Board Meetings
5. Weekly and Monthly Status Reports
6. Monthly Quad Chart Status Report on Critical Projects