4-D Weather Data Cube

FY10 Capability Evaluation Plan

Version 1.0

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1 Introduction

The FY10 4-D Weather Data Cube Capability Evaluation[1] (Capability Evaluation) will be a joint effort of the National Oceanic and Atmospheric Administration (NOAA), the Federal Aviation Administration (FAA), and the European Organisation for the Safety of Air Navigation (EUROCONTROL) to show progress made towards the development of the 4-D Weather Data Cube (Cube).

1.1 Purpose

The purpose of this FY10 4-D Weather Data Cube Capability Evaluation Plan (Plan) is to be a single point of reference for all aspects and activities leading up to the execution of the Capability Evaluation. This Plan provides a description of:

- The activities leading up to the Capability Evaluation
- The physical architecture intended for the Capability Evaluation
- The expected schedule of events for the Capability Test & Evaluation and the High-Level Capability Evaluation Presentation
- The requirements describing the capabilities to be assessed during the Capability Evaluation; and
- The evaluation criteria.

This plan does not include the detailed test procedures, which will be used to verify that the prescribed requirements have been met. Those procedures will be contained in the ***FY10 Capability Test and Evaluation Procedures*** document.

1.2 Background

Since FY07, the FAA's Next Generation Air Transportation System (NextGen) Net-Enabled Weather (NNEW) Program has conducted a yearly IT Demonstration (called Capability Evaluation starting in FY10) to exemplify progress towards the development of the Cube.

In the FY07 Demonstration, the following objectives were set and accomplished: develop and refine the standard data formats and services, become familiar with the Service Oriented Architecture (SOA) development/test environment at the FAA William J. Hughes Technical Center (WJHTC), establish basic connectivity between the laboratories performing the development work and the WJHTC, and build a display capability that is flexible enough to adapt to a variety of future data display needs.

The objectives set and accomplished for the FY08 Demonstration were: utilize Open Geospatial Consortium (OGC) standards, publish data using SOA, establish a working WellGEO registry/repository (reg/rep), construct a data visualization tool, and make data available from various locations in order to demonstrate the virtual Cube concept.

The capabilities that were demonstrated in FY08 were further enhanced and built upon during the FY09 Demonstration, which accomplished the following: demonstrated Version 1 of the Web Feature Service/Web Coverage Service (WFS/WCS) Reference Implementation (RI) and Functional Test Suites,

[1] The Capability Evaluation consists of two events; one being the Capability Test and Evaluation, and the other being the High-Level Capability Evaluation Presentation.

utilized and published data in Cube compliant data formats, utilized ebXML registries, demonstrated federation of reg/reps, searched both Climate and Forecast (CF) & Joint METOC Broker Language (JMBL) formatted data using ontology, and used metadata in accordance with Metadata Guidelines. An important facet of the FY09 Demonstration was that NOAA participated with the FAA to demonstrate interagency data sharing.

Table 1 below shows the high level goals for this year's Capability Evaluation and future years through 2012.

Capability Evaluation (year)	***Participants***	***Goals***
2010	FAA WJHTC, FAA AIM, NOAA NWS, NOAA NSSL,NOAA GSD, MIT/LL, NCAR, EUROCONTROL	• Simulate operational Cube functionality as closely as possible to show how the Cube will operate at IOC, including all applicable Cube standards and any available hardware and software infrastructure • Use version 2 of WCS & WFS RIs • Test performance and security of data dissemination utilizing Cube standards.
2011	FAA WJHTC, FAA AIM, NOAA NWS, NOAA NSSL,NOAA GSD, MIT/LL, NCAR, EUROCONTROL, additional weather providers and users	• Use and evaluate an architecture that more closely resembles the proposed operational architecture • Transition additional data sources to operational sources • Publish additional products • Use version 3 of WCS & WFS RIs • Evaluate mediation • Add additional service adaptors • Evaluate additional security functionality
2012	FAA WJHTC, FAA AIM, NOAA NWS, NOAA NSSL,NOAA GSD, MIT/LL, NCAR, EUROCONTROL, additional weather providers and users	• Evaluate initial Complex Retrieval Processing capability • Use and evaluate an architecture that approaches the proposed operational architecture • Transition additional data sources to operational sources • Publish additional products • Use version 4 of WCS & WFS RIs • Add additional service adaptors • Refine 2015 security requirements • Evaluate additional security functionality

Table 1 - Capability Evaluation Goal Spreadsheet

1.3 Objectives

The primary and secondary objectives of this year's Capability Evaluation are as follows:

Primary Objective: To simulate operational Cube functionality as closely as possible to show how the Cube will operate at the Initial Operating Capability (IOC), including all applicable Cube standards and any available hardware and software infrastructure.

This will be accomplished in the following manner:

- Legacy providers will publish data, enabling them to be part of the Cube[2] by utilizing a Provider Cube Service Adaptor (PCSA), or NOAA equivalent.
- Legacy consumers will consume data from the Cube by utilizing a Consumer Cube Service Adaptor (CCSA), or NOAA equivalent.
- A 4-D Weather Data Cube Technical Architecture Framework of standards (see Appendix B) will be utilized.
- Data will be disseminated via the FAA Telecommunications Infrastructure (FTI) network and NOAAnet Access Subnetwork (NOAAnet) through boundary protection schemes (ED-8 gateway, NOAAnet gateway, etc.) to the maximum extent possible.
- Federate deployed reg/rep data across agency boundaries.
- Implement Version 2 requirements for WCS/WFS RI functionality (see Appendix C)
- Include partner prototypes/capabilities (e.g., Aeronautical Information Management (AIM)).
- Include prototype Network-Enabled Verification Service (NEVS) as a data consumer.

Secondary Objective: To test performance and security of data dissemination utilizing Cube standards.

This will be accomplished in the following manner:

- Data requests will be made utilizing a National Airspace System (NAS) Automation Simulator (Simulator) to demonstrate satisfaction of query responses.
- Latencies will be measured utilizing the Simulator to the extent possible.
- FAA security provisions will be enabled in a System Wide Information Management (SWIM) container between an Origin Server and CCSA, supported through the use of a key management service.

1.4 Capability Evaluation Requirements

During the FY10 Capability Evaluation the following requirements will be tested:

- The system level requirements presented in Appendix D .
- The requirements of Versions 1 and 2 of the WCS/WFS RI Requirements.
- The NEVS requirements stated in Appendix E.
- The ability to publish and subscribe to the list of the dataset/products in Appendix F . Appendix G presents those requirements associated with the specific Capability Evaluation activities to be performed for supported datasets/products.

[2] Refer to the "NNEW White Paper – Version 2.0" (Page 16) for clarification on the difference between making data available *to the Cube* versus *as part of the Cube*.

2 FY10 Capability Evaluation Architecture

The Capability Evaluation will be conducted at the FAA WJHTC. As shown in Figure 1, several systems that exist on different enterprise networks will be communicating through enterprise boundaries. The communications between the participating facilities will be: NOAA's NOAAnet, FTI, Internet, and Internet2. Data will be published and consumed through these communication networks as required to show limited Cube functionality.

Data will be published by NOAA at the National Operational Model Archive and Distribution System (NOMADS), the Aviation Weather Center (AWC), the National Severe Storms Laboratory (NSSL), and the Meteorological Development Laboratory (MDL) via NOAAnet. Some NOAA systems will utilize the Global Systems Division (GSD) to serve their data through NOAAnet, while the others will have a dedicated NOAAnet connection. The National Center for Atmospheric Research (NCAR) and Massachusetts Institute of Technology - Lincoln Laboratory (MIT/LL) will publish data from Boulder, Colorado and Lexington, Massachusetts respectively via Internet2. EUROCONTROL will publish data via the Internet. The FAA's AIM Program will publish aeronautical information from Washington, D.C.

The high-level architecture for the Capability Evaluation is shown in Figure 1.

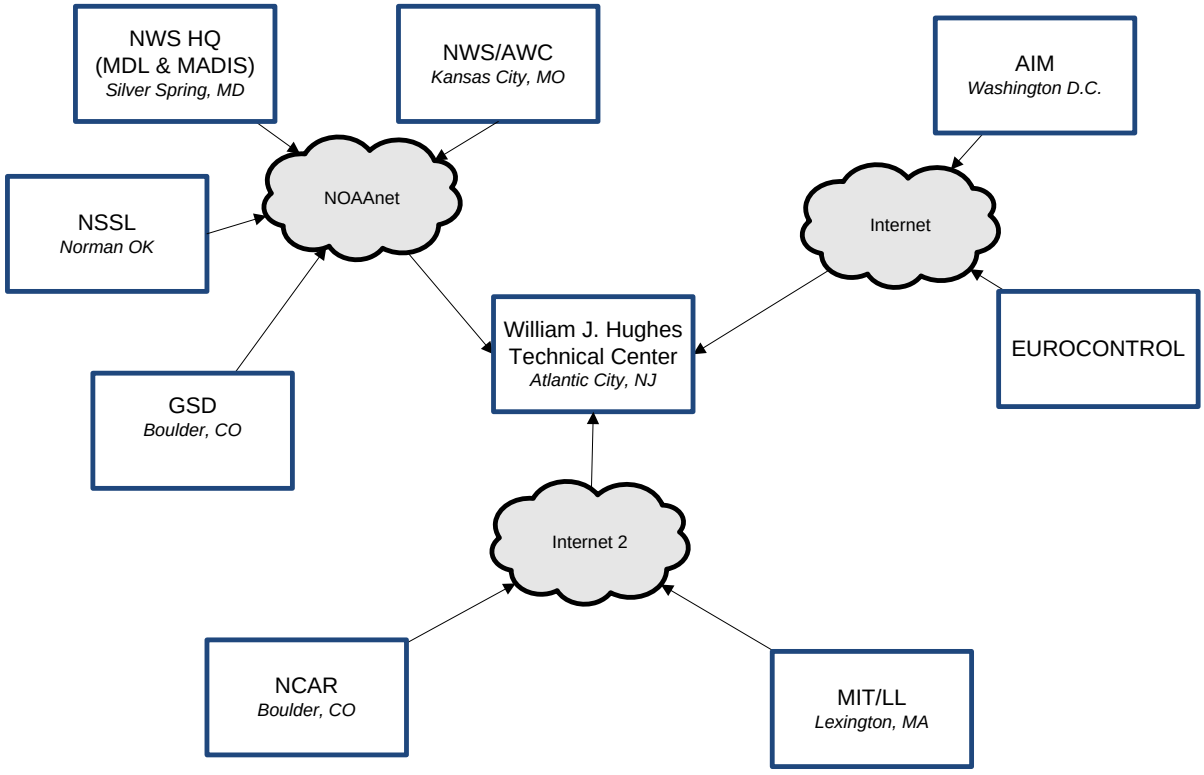

Figure 1 - FY10 Capability Evaluation High-Level Architecture

2.1 FAA

2.1.1 William J. Hughes Technical Center

Figure 2 illustrates the FAA Systems that will exist on the FTI Research and Development (R&D) Enclave within the NextGen Weather Evaluation Capability (NWEC) Domain at the WJHTC. These systems will

consist of the Advanced Technologies & Oceanic Procedures (ATOP), Flight Data Processor 2000 (FDP2K), Dynamic Ocean Tracking System (DOTS), Regional AWOS Data Acquisition Systems (ADAS) Service Processor (RASP), and the NextGen Weather Processor (NWP). An internet access point (IAP) will serve as a means of connection between the FAA and the participating organizations using Internet and Internet2.

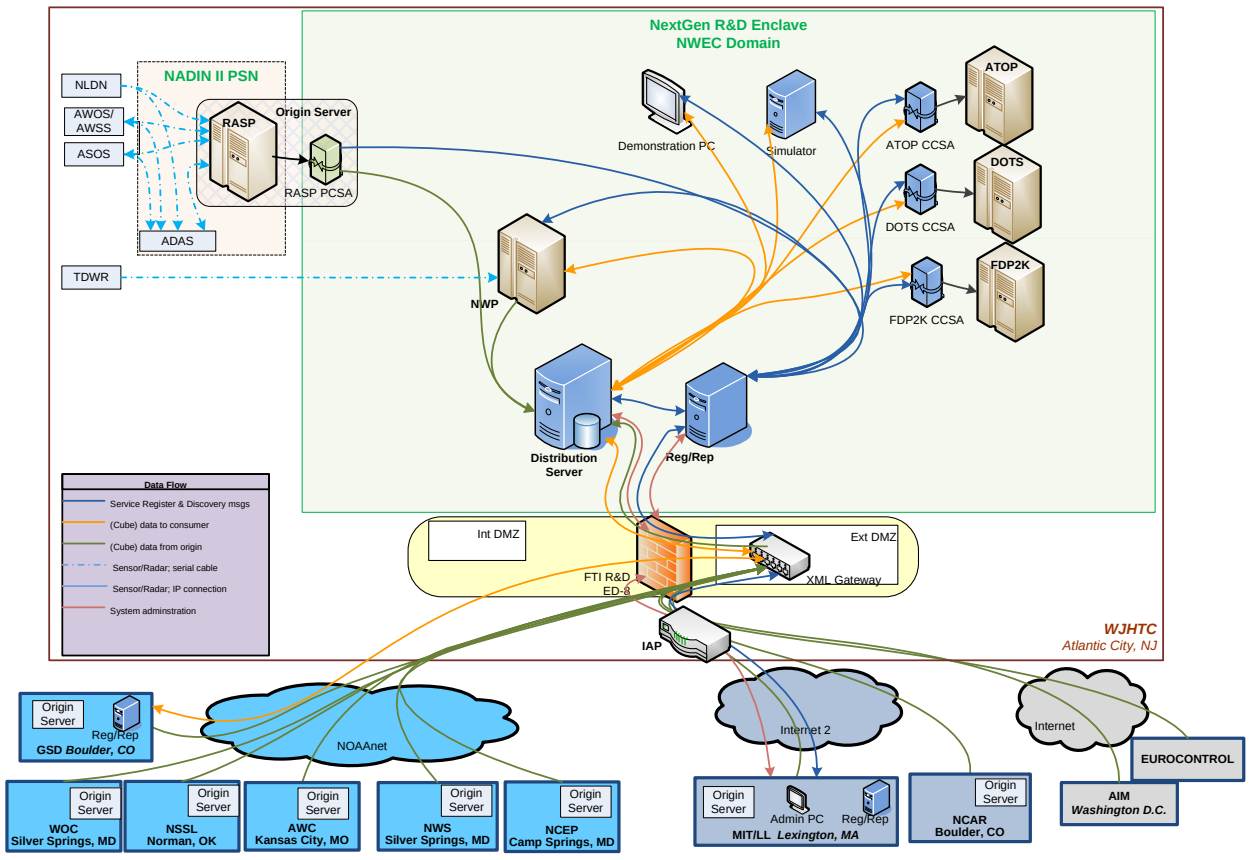

Figure 2 - WJHTC's FY10 Capability Evaluation Architecture

2.1.1.1 Network / Telecommunications

2.1.1.2 FTI

The FTI network supports NAS operations by providing the connectivity required by systems. FTI provides an enterprise-wide approach to information security assurance. It meets the latest Government standards for information security, and offers improved security services. To support the needs of the FAA, FTI has fully implemented three networks:

- FAA Operational IP Network (OPS IP) – The OPS IP is used to carry mission and operationally critical data for air transportation needs throughout the NAS. At IOC, the Cube will use the OPS IP as the underlying backbone of data transport within the FAA. Since FAA security policies preclude any direct connection of non-NAS systems to NAS systems, security extranet gateways

will utilize boundary protection mechanisms to allow non-NAS systems to access Cube data residing in the NAS. These extranet gateways are referred to as "ED-8" gateways by FTI. The current plan at IOC is to utilize all operational NAS FTI ED-8 gateways to handle the traffic between NAS and non-NAS systems. The OPS IP network has four ED-8 gateways located at WJHTC, Salt Lake Air Route Traffic Control Center (ARTCC), Atlanta ARTCC, and the FAA academy in Oklahoma City. The ED-8 will be the interface point between the FAA and NWS via NOAAnet for the sharing of weather data. The network security of FTI (e.g., DMZ, IAP, Access Control List (ED-11), and Virtual Private Network (ED-6)) will provide a secure connection for dissemination / receipt of weather data to / from the external partners and systems.

- FTI National Test Bed – FNTB is a simulation of OPS IP. This network simulates multiple FAA facilities (e.g., ARTCC, Terminal Radar Approach Control (TRACON), Flight Service Station, etc.). FNTB has one dedicated ED-8 gateway. The primary use of the FNTB is for testing of NAS systems prior to operational deployment.
- Mission Support – Mission Support is utilized by the FAA to support the everyday operations of the FAA. This network supports email, payroll, internet, and other administrative services. Via the internet, FTI Mission Support was the primary network of the FY08 and FY09 IT Demonstrations. However, a more OPS IP like network is preferred to demonstrate the capabilities of the Cube as its functions and capabilities mature.

A fourth network, initially funded by the NNEW Program, will be established by May 2010. Referred to as the R&D Enclave, this network will provide a gateway to research partners throughout the world. This network will be heavily used for the FY10 Capability Evaluation. The R&D Enclave provides an OPS IP-like network with the flexibility to relax security options.

2.1.1.3 Internet

Through a dedicated IAP of the R&D Enclave, connections to research partners will be available. Security will be enforced with the use of virtual private network (VPN) secure access. The Internet will provide connectivity to AIM, EURCONTROL, and NCAR.

2.1.1.4 Internet 2

Through the R&D Enclave IAP, Internet 2 will be connected to the FAA. Internet 2 is a high speed network connecting universities, corporations, and Federal agencies. This network will be utilized to connect to MIT/LL and NCAR. Similar to the Internet, Internet 2 will also require VPN secure access.

2.1.2 FAA 4-D Weather Data Cube Prototypes

As shown previously in Figure 2, the NNEW Prototypes will consist of a distribution server, reg/rep, origin servers (for RASP), and CCSAs (for ATOP, DOTS, and FDP2K). For the FY10 Capability Evaluation, RASP will not consume data, but will only publish data. The prototypes and their interactions are discussed in the following sections.

2.1.2.1 Origin Servers

An Origin Server will be used by RASP to increase the efficiency of converting products from legacy formats to Cube formats. The Origin Server will also allow for the storage of these products so that with each request for a product, the data will not have to be converted every time. When a request comes in, the distribution server will assemble the necessary data from the Origin Server rather than the RASP system. The PCSA is the software that will be located on the Origin Server to assist in the data translation processes.

2.1.2.2 Consumer Cube Service Adaptors

CCSAs are in the process of being developed for legacy systems that will subscribe to data. For the Capability Evaluation ATOP, DOTS, and FDP2K will all have CCSAs. CCSAs are necessary for converting the Cube format of the products into legacy-system-readable formats.

2.1.2.3 Distribution Server

Distribution Servers aggregate requests/subscriptions from CCSAs and request/subscribe to data from the Origin Servers. The Distribution Server will also communicate with the NWP, NAS Simulator Client, and the Evaluation PC. Requests/Subscriptions will flow from the systems to the CCSAs. The Distribution Server will determine if it contains the necessary data. If not, the Distribution Server will query the reg/rep to find out the location of the data. Once the location of the data is identified, the Distribution Server will receive the location and request the data. The Distribution Server will then be responsible for sending the requested datasets to the system's CCSA for legacy format conversion.

2.1.2.4 Reg/Rep

The reg/rep will store metadata about the datasets that will be available for the FY10 Capability Evaluation. The metadata will be separated into fields and then can be located through a single search term. The reg/rep will also have a runtime capability which assists in searching for and subscribing to Cube data. The reg/rep located at the WJHTC will be the primary reg/rep for the Capability Evaluation. Both MIT/LL and the NWS will also have a reg/rep for the Capability Evaluation. It is also important to note that all reg/reps participating in the Capability Evaluation will be federated.

2.1.3 NWEC Lab

The NWEC Lab will be the physical location at the WJHTC where all of the testing will take place (testing will be further discussed in Section 5). The NWEC Lab will consist of the Simulator (see section **Error! Reference source not found.**), the Evaluation PC (see section 2.1.5), and the NNEW Prototypes (see section 2.1.2). FAA pertinent information will flow into the NWEC Lab through the R&D Gateway which will be an access point to the FTI R&D Enclave at the WJHTC. All of the testing and verification will be done in the NWEC Lab.

2.1.4 NWP

The NWP, a system that is currently under development, will have built-in Cube functionality and therefore will directly access the distribution server rather than going through a CCSA or an Origin Server. For the FY10 Capabilities Evaluation, the NWP will subscribe to the Cube in order to access the Next Generation Radar (NEXRAD) Level III base reflectivity datasets published by NOAA and other organizations (see Figure 3). The datasets utilized will be the base reflectivity data for the NEXRADs feeding the New York ARTCC. Once the NWP ingests the NEXRAD Level III data, it will transform the data into the Regional Base Reflectivity Mosaic for the New York ARTCC. This mosaic will then be published to the Cube for subscription by users.

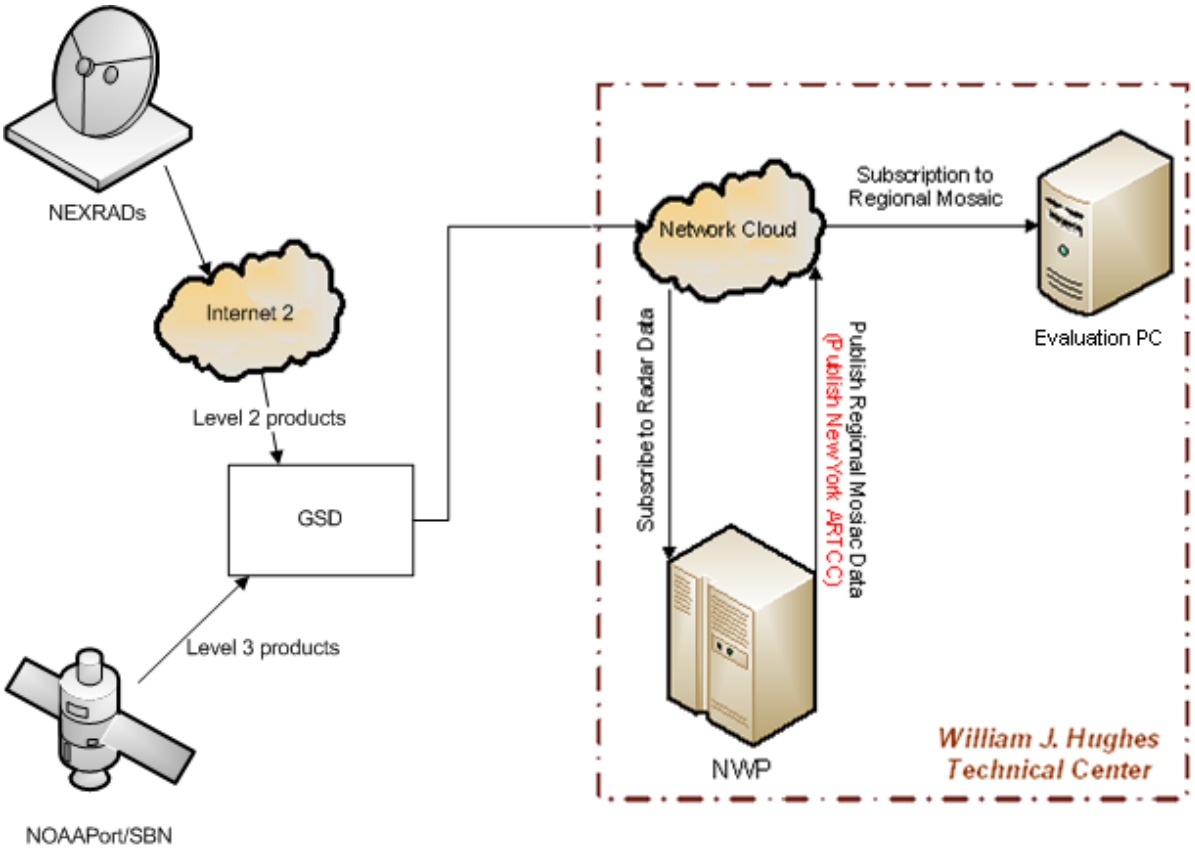

Figure 3 - NWP Data Flow for the FY10 Capability Evaluation

2.1.5 Evaluation PC

Configured with OGC compliant software to request and display weather data from the Cube, the Evaluation PC will be used to demonstrate the implementation of the Web Services. The Evaluation PC will be a standalone PC running the Red Hat 5 Operating System. The primary application to display weather data will be Integrated Data View (IDV) tool, open source distributed by Unidata. IDV is Java-based software for analyzing and visualizing geosciences data. The IDV brings together the ability to display and work with satellite imagery, gridded data, surface observations, WSR-88D Level II and III radar data, GEOTIFF, and various other data types, all within a unified interface. Custom plug-ins to interface to the Web Services will be developed. All data collected from this PC during testing and evaluation will be archived and stored for future reference.

2.1.6 NAS Automation Request Simulator

Located at the WJHTC and on the R&D Enclave, the Simulator is a standalone PC running the Red Hat 5 operating system. The purpose of the Simulator is to stress the registries and distribution server. This will assist in the demonstration of Cube operations in a typical NAS environment. The primary software application utilized by the simulator is iTKO LISA. iTKO LISA is Commercial-off-the-Shelf (COTS). It is testing and validation software currently used by the FAA in the System Wide Information Management (SWIM) Program. LISA provides NNEW the flexibility to incorporate source code to emulate generic FAA systems/consumers of Cube data. Capable of simultaneously simulating multiple users, the Simulator will subscribe to weather product in the Cube and/or send queries in automated timed bursts or at the user's request to test general Cube functionality. IDV will be the primary display tool of the weather

data retrieved bye the Simulator. All weather data will be archived for further analysis.

Additionally, the Simulator will be used to collect latency and other performance information. These data will be used for lessons learned and provide future knowledge of Cube requirements. The specific performance information that the Simulator will collect is described in Section 3.

2.2 NOAA NWS

NOAA's National Weather Service provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.

This year's evaluation will be the second that NWS has participated in (the FY 2009 IT demonstration being the first). In this year's Capability Evaluation, NWS will provide a significant set of aviation-relevant products and services from a number of systems or repositories. These products and services (and the NWS organizations that will provide them) are tabulated immediately below (see Table 2), and then described in the following subsections.

NWS Organization	System(s)	Products
Office of Science and Technology, MDL	LAMP, NDFD, reg/rep	LAMP Experimental Guidance TAFs, NDFD Grids
Office of Science and Technology, System Engineering Center (SEC)	JMBL Server, reg/rep	TBD
National Centers for Environmental Prediction (NCEP) Environmental Modeling Center (EMC) and Central Operations (NCO)	NOMADS	RUC
NCEP Aviation Weather Center	Consolidated Aviation Web Services (CAWS) – includes ADDS, WAFS Data and Web Services, and more	SIGMETs, PIREPs, GTG, CIP/FIP, TAFs, AIRMETs, CCFP
Office of Operational Systems, Telecommunications Operations Center	NOAAnet	NOAA Communications Infrastructure and Gateway to FAA

Table 2 - NWS Services and Products

2.2.1 NWS

2.2.1.1 NWS's 4-D Weather Data Cube Design Concepts

2.2.1.1.1 CIES

Cube Input Edge Services (CIES) provide for the ingest of weather data required by the Cube (obtained either directly from the native source or via an SA). They also perform the necessary processing and local storage and allow for remote access to the weather data (or subsets thereof) via WCS/WFS or other web services. Virtual Machines will be used to provide packaged, tested, encapsulated software and services. The analogous FAA services are provided by the prototype Origin Server.

2.2.1.1.2 COES

Cube Output Edge Services (COES) provide for the request and retrieval of Cube data from remote WCS/WFS or other web services, perform the necessary processing, and allow access to the data by the requesting local destination system (via SA). Virtual Machines will be used to provide packaged, tested, encapsulated software and services. The analogous FAA services are provided by the prototype Distribution Server.

2.2.1.2 MDL

MDL, located at NWS headquarters in Silver Spring, Maryland, develops and implements scientific techniques into NWS operations, furnishes a range of forecast guidance products, provides interactive tools for decision assistance and forecast preparation, and conducts comprehensive evaluations of NWS Products. From among the MDL suite of products, at least three product types are planned for inclusion in this year's Capability Evaluation:

- National Digital Forecast Database Grids (NDFD)
- Localized Aviation MOS Program (LAMP) Experimental Guidance TAFs
- AutoNowcaster (ANC) products

NDFD – As the foundation of the NWS Digital Services Program, the NDFD consists of gridded forecasts of sensible weather elements (e.g., cloud cover, maximum temperature). NDFD contains a mosaic of digital forecasts from NWS field offices working in collaboration with NCEP. The database is available for creating text, graphic, gridded, and image products. During the FY09 Demonstration, MDL provided NDFD winds. A companion to NDFD is the National Digital Guidance Database (NDGD) which contains guidance forecasts in gridded formats that are interoperable with NDFD.

The weather elements in NDFD apply to a variety NWS programs. Weather elements such as wind speed and direction have obvious application to the Cube. Other weather elements, such as snow amount, apply to ground operations. MDL's instance of the WCS will serve the following NDFD weather elements:

<u>Basic Surface Weather Elements</u>

12-hour Probability of Precipitation (PoP12)
Dew Point (Td)
Maximum Temperature (MaxT)

Minimum Temperature (MinT)
Quantitative Precipitation Amount (QPF06)
Sky Cover (Sky)
Snow Amount (Snow)
Temperature (T)
Wind Direction (WDir)
Wind Gust (WGust)
Wind Speed (WSpd)

Convective Outlook Hazard Probabilities

Convective Hazard Outlook (ConHazO)
Probability of Tornadoes (PTornado)
Probability of Hail (PHail)
Probability of Damaging Thunderstorm Winds (PTstmWinds)
Probability of Extreme Tornadoes (PXTornado)
Probability of Extreme Hail (PXHail)
Probability of Extreme Thunderstorm Winds (PXTstmWinds)
Total Probability of Severe Thunderstorms (PTotSvrTstm)
Total Probability of Extreme Severe Thunderstorms (PTotXSvrTstm)

Two important NDFD grids will be omitted from the FY10 Capability Evaluation—Weather and Hazards. These weather elements will be very important to the Cube. The encoding schemes for both, however, are quite challenging. MDL hopes to take on these challenges in FY11.

The LAMP is the NWS's premier source of statistical guidance for aviation services. LAMP has successfully provided guidance to NWS forecasters as they prepare Terminal Aerodrome Forecasts (TAF). Moreover, for the most important aviation weather elements (e.g., ceiling and visibility), LAMP forecasts probability distributions. LAMP forecasts are issued as station forecasts as well as gridded forecasts. MDL's instance of the WCS will serve the following LAMP weather elements:

- Categorical Thunderstorm
- Dew Point
- Temperature
- Thunderstorm Probability

LAMP Experimental Guidance TAFs--will be created from LAMP guidance, and they will be encoded in the Weather Information Exchange Model (WXXM). Additionally, MDL will explore WXXM encoding schemes that will support a more probabilistic approach to aerodrome forecasting. The generation and retrieval of both these products will be tested during the Capability Test and Evaluation, but will not be demonstrated at the High Level Capability Evaluation Presentation due to their experimental nature.

ANC is an automated system that provides short-term forecasts of convective storms based on extrapolation of current radar echoes, model output, and mesoscale fields in the path of convection. ANC was originally developed by NCAR, who has modified the system to enable NWS Weather Forecast Offices the opportunity to review and modify ANC's mesoscale analyses, improving the forecast performance. MDL has implemented this prototype capability in its developmental AWIPS environment. This capability will be tested during the Capability Test and Evaluation, but will not be demonstrated at

the High Level Capability Evaluation Presentation due to its experimental nature. The following ANC products will be available via MDL's WCS:

- 3-DWindFiled-Analysis-Ajoint-MLB
- 60MinTstormFcst-Autonowcaster-MLB
- 60MinTstormInitLikelihood-Autonowcaster-MLB
- TstormFcstVerification-Autonowcaster-MLB
- 3-DWindFiled-Analysis-Adjoint-FWD
- 60MinTstormFcst-Autonowcaster-FWD
- 60MinTstormInitLikelihood-Autonowcaster-FWD
- TstormFcstVerification-Autonowcaster-FWD

MDL will host the NWS's instance of the reg/rep server. Two servers will be clustered with a so-called "floating license" shared between them. This will be the first insight into testing this capability in a more reliable setting.

MDL will be linked via a secure, NextGen-dedicated NOAANet connection to the NOAA NWS (and other) NextGen registries to enable the discovery and access of NDFD, LAMP, ANC, and possibly other products.

MDL's architecture for supporting the FY10 Capability Evaluation is shown in Figure 4.

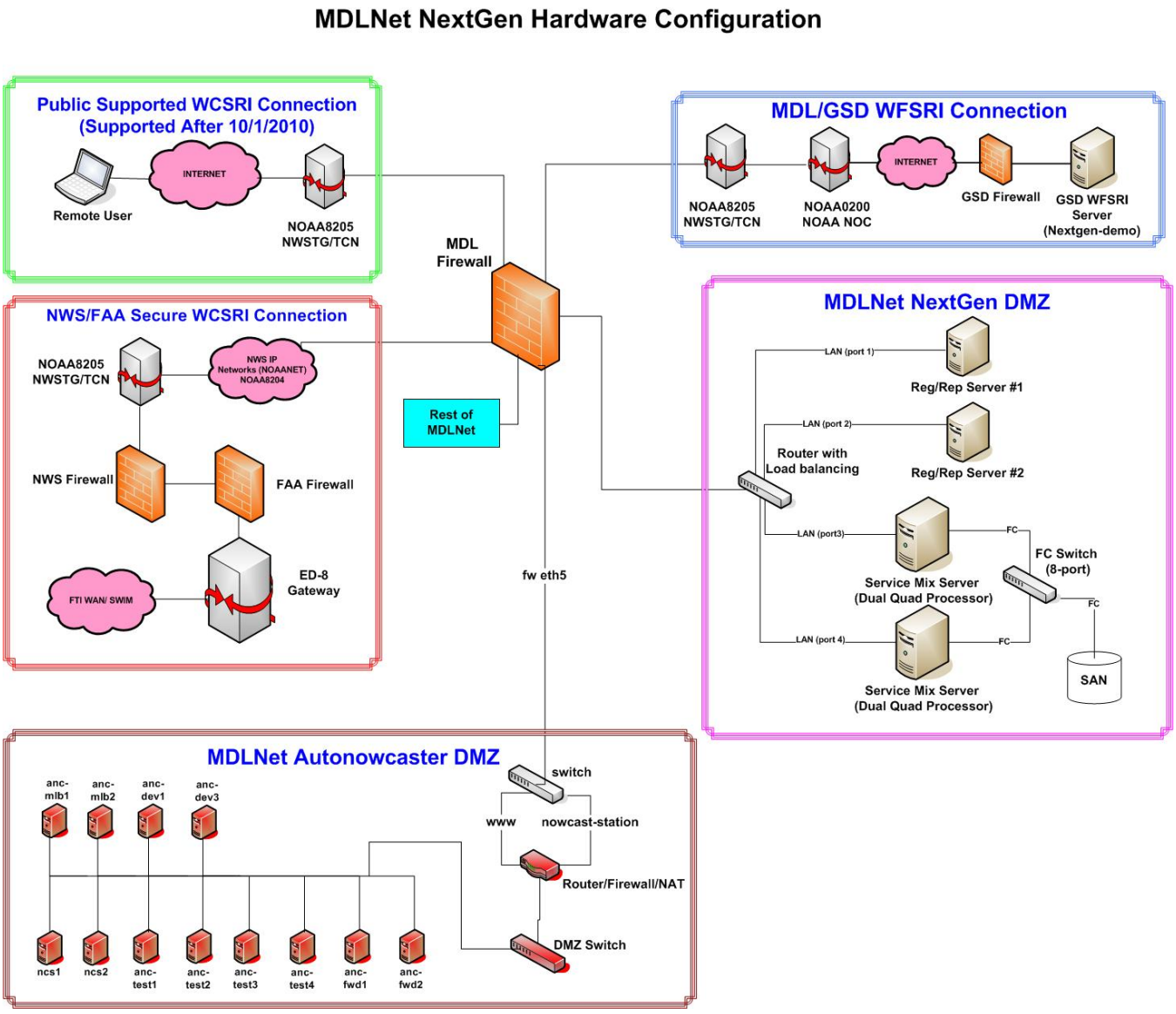

Figure 4 - MDL's NextGen Environment – Supporting the FY10 Capability Evaluation

2.2.1.3 SEC

SEC, located at NWS headquarters in Silver Spring, Maryland, leads numerous systems engineering, development, integration, and testing efforts within NWS. These efforts cover observing, information processing, display, and communications systems. SEC's role in the FY10 Capability Evaluation will be to host a JMBL server, as well as providing various support for the evaluation. In addition, a secondary instance of the reg/rep server may also be housed at this location. There will be no data-provider-type data store at this location.

The SEC registries will be linked via a secure, NextGen-dedicated NOAAnet connection to other Capability Evaluation sites, thus facilitating the discovery and access of NOAA products during this year's tests and demonstrations.

SEC's architecture for supporting the FY10 Capability Evaluation is shown in Figure 5.

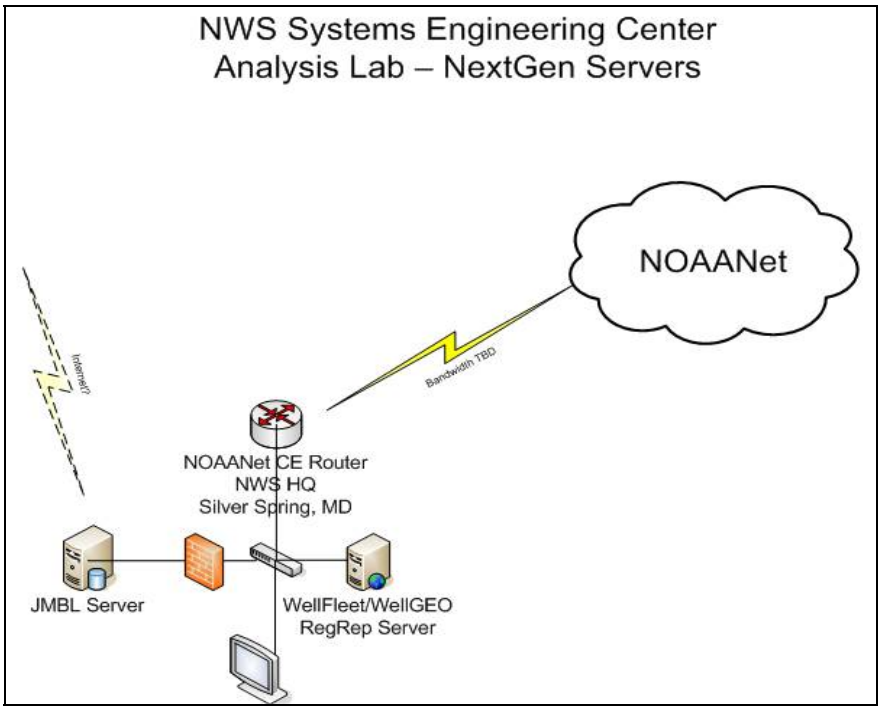

Figure 5 - SEC's NextGen Environment – Supporting FY10 Capability Evaluation

2.2.1.4 NCEP/NOMADS

NOAA NCEP, headquartered in Camp Springs, Maryland, developed and runs the NOMADS. There are developmental and operational versions of this system. For the September FY10 Capability Evaluation, a NOMADS system will be used. NOMADS is designed to provide real-time and retrospective, format-independent access to climate, ocean, and weather model data, and advance the integration of real-time model data and applications responding to strategic guidance and NOAA's role. NOMADS includes a common web services infrastructure to support the discovery, access, and transport of data. It will be augmented with NextGen-type access services for this year's evaluation. Grids from NCEP's Rapid Update Cycle (RUC) model will be served by NOMADS, and it is anticipated that the NextGen WCS will be used. NOMADS will be linked via a secure, NextGen-dedicated NOAAnet connection to the NOAA (and other) NextGen registries to enable the discovery and access of RUC, NAM, and GFS grids during this year's Capability Evaluation.

The NCEP/NOMADS architecture for supporting the FY10 Capability Evaluation is shown in Figure 6.

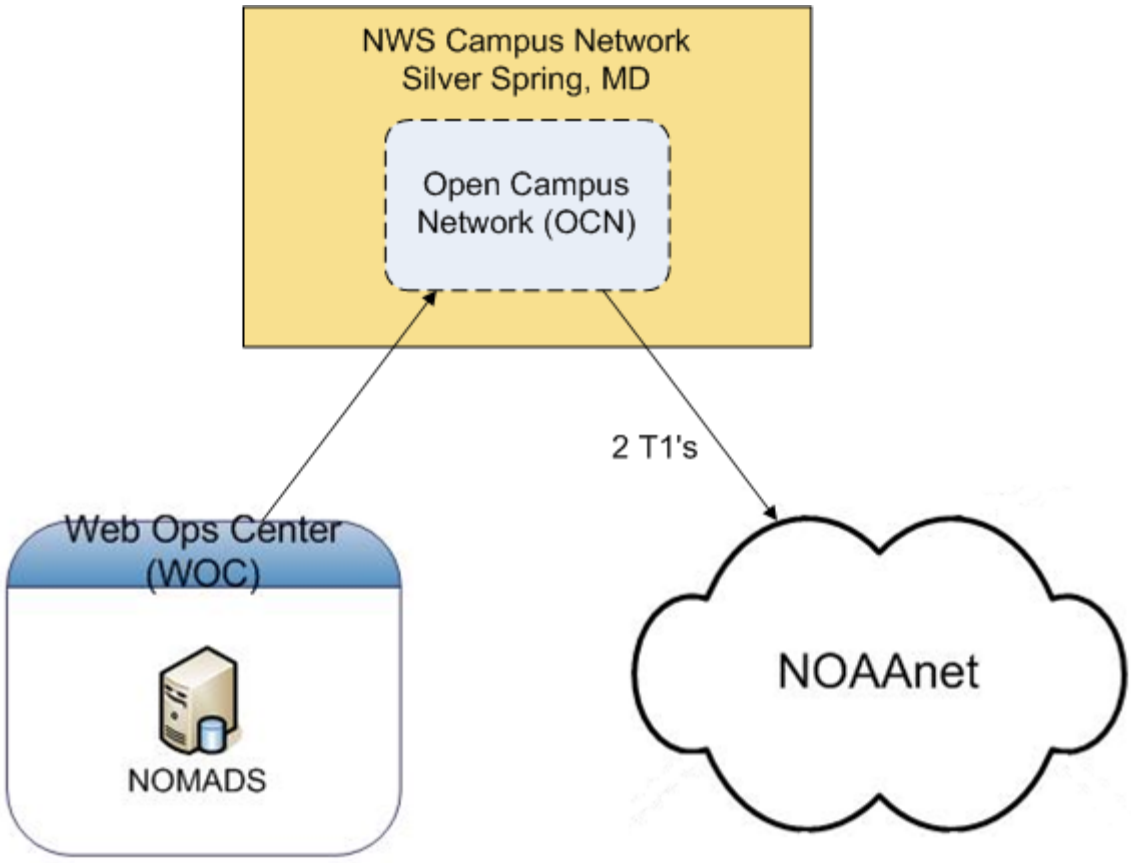

Figure 6 - NOMADS (NextGen Interface Supporting FY10 Capability Evaluation).

2.2.1.5 NCEP/AWC

NOAA's AWC, located in Kansas City, Missouri, is part of the NCEP. The AWC delivers consistent, timely, and accurate weather information for the world airspace system.

AWC will bring several important capabilities to this year's capability evaluation. AWC's Consolidated Aviation Web Services (CAWS) are an FAA-approved source of aviation weather. CAWS is certified by the FAA as a Qualified Internet Communications Provider for weather and NOTAMs. CAWS is scalable (to accommodate new requirements) and has standards for reliability (e.g., no outages exceeding 10 minutes), accessibility, security, and archive (at least 15 days retention). CAWS includes ADDS, which features the ADDS Data Server (providing flexible and queryable access to real-time METAR, PIREP, TAF and AIR/SIGMET data). CAWS also includes WAFS web services and WAFC Internet File Services. CAWS also encompasses the AWC NextGen Aviation Weather Testbed.

AWC's Aviation Weather Testbed provides a means of testing new science and technology for the purpose of eventually producing better aviation weather products and services. The execution of the Testbed is accomplished via close collaboration between the AWC and its many partners.

For the FY10 Capability Evaluation, AWC is looking at providing some subset of the following products: SIGMETs, PIREPs, GTG, CIP, FIP, TAFs, AIRMETs, and CCFP. Of these, GTG, CIP, and FIP would be suitable for WCS access, whereas the other products would more likely utilize WFS. AWC will be linked via a secure, NextGen-dedicated NOAAnet connection to the NOAA (and other) registries to enable AWC product discovery and access during this year's Capability Evaluation.

The NCEP/AWC architecture for supporting the FY10 Capability Evaluation is shown in Figure 7.

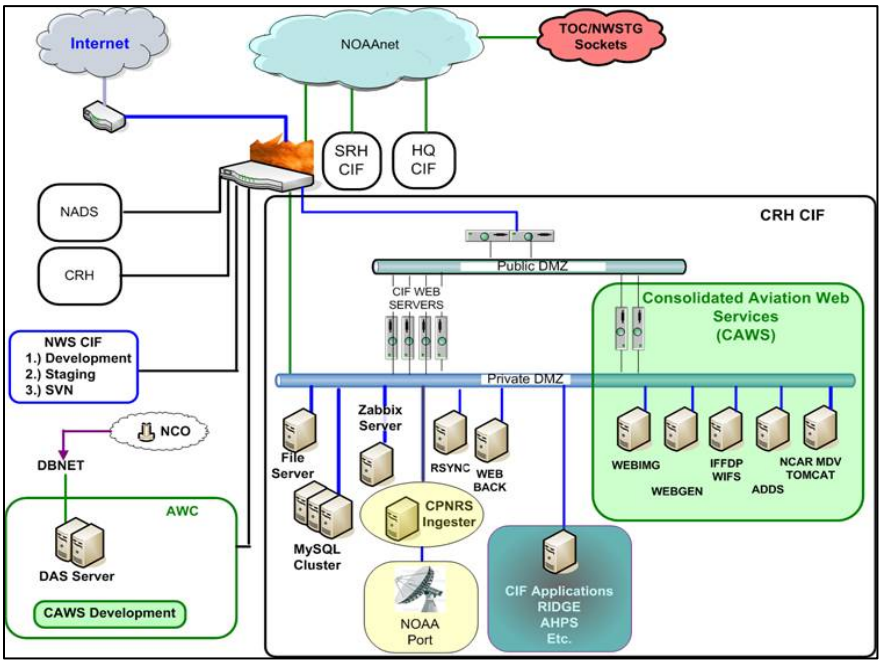

Figure 7 -- NWS Consolidated Internet Farms (includes and/or interfaces with CAWS and other AWC systems)

2.2.1.6 NOAAnet

NOAAnet is emerging as an accepted mechanism for Wide Area Network transport for NOAA communications. It features an IP-based "any-to-any," scalable, secure architecture. The goal of the NOAAnet project is to establish an agency-wide network infrastructure by converging and consolidating legacy networks onto a single, centrally-managed platform—in many cases replacing point-to-point circuits. NOAAnet will provide an infrastructure that enables NOAA-external entities to communicate with the NWS. Already, NOAAnet is providing centralized, cost-effective network management (e.g., support, monitoring, troubleshooting, and configuration management). With high-availability backup options, NOAAnet is already providing communications services for NOAA mission-critical systems, such as AWIPS. The NOAAnet project is led out of the NWS Office of Operational Systems extended to all participating NOAA sites.

For this year's Capability Evaluation, NOAAnet will be extended to most or all participating NWS sites. Broadly speaking, some of the participating sites have pre-existing NOAAnet connections. However, such pre-existing connections support various types of network traffic and are not reserved for NextGen. Therefore, in order to ensure a secure, NextGen-dedicated communications channel, a NextGen VPN is being established for this year's evaluations. The Figure 8 illustrates the *planned* NextGen-related NOAAnet connections and, in effect, summarizes the NWS participation planned for this year's capability evaluation.

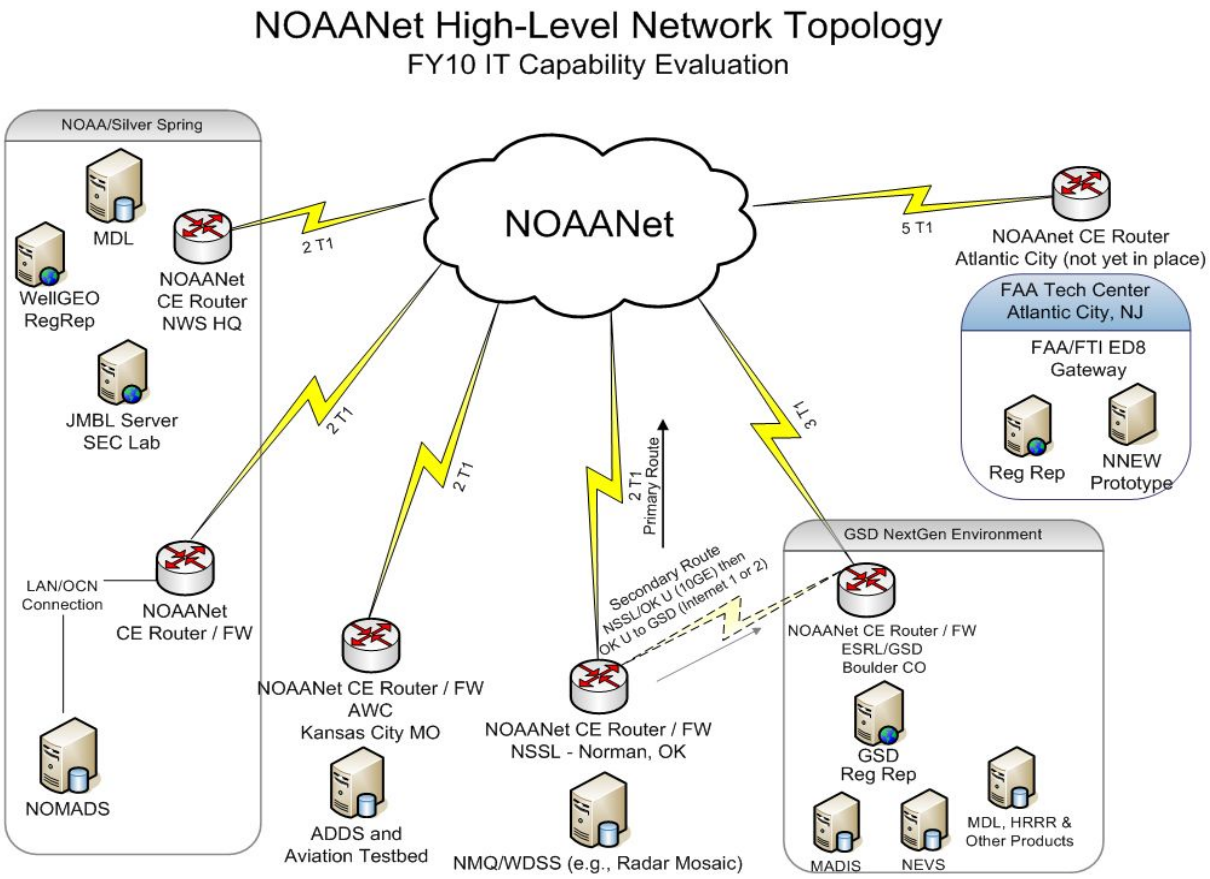

Figure 8 – NOAAnet Connections Supporting FY10 Capability Evaluation

2.3 NOAA OAR

From within NOAA's Office of Oceanic and Atmospheric Research, two organizations will be participating in this year's capability evaluation: GSD and NSSL.

2.3.1 GSD

NOAA GSD of the Earth System Research Laboratory (ESRL) conducts research and development to provide observing, prediction, computer, and information systems that deliver environmental products ranging from local to global predictions of short-range, high impact weather, and air quality events to longer-term, intra-seasonal climate forecasts. GSD develops environmental information systems to support commerce, transportation, emergency management, and other societal needs. GSD will be participating in the FY10 Capability Evaluation, providing a wide range of products such as NEXRAD (level 3), GOES East and West, numerical model products (e.g., WRF-RR and HRRR), surface observations, and others. A complete list of GSD-provided products appears in Appendix D.

The GSD NextGen environment will enable a limited set of Meteorological Assimilation Data Ingest System (MADIS) products, such as METAR, mesonet, and maritime sensor observations. The processing of net-enabled data by NEVS and depiction of the resulting verification information from NEVS will be demonstrated. GSD's NextGen environment will provide an entry point for NSSL products (described in section 2.3.2 of this Plan), and non-gridded products from MDL (described in section 2.2.1.2) and the Aviation Weather Center. NOAAnet connectivity to GSD's NextGen environment will enable secure data

exchange with FAA and other NOAA sites across dedicated circuits. NOAAnet is more fully described in section 2.2.1.6.

GSD is building a testing capability to provide an environment suitable for simulating basic Cube data-provider functionality, edge services, and dedicated, secure network connectivity via NOAAnet. GSD will host a reg/rep, which will enable the discovery of the datasets provided from GSD's testing environment, and will be federated with reg/reps at other locations.

GSD's architecture for supporting the FY10 Capability Evaluation is shown in Figure 9.

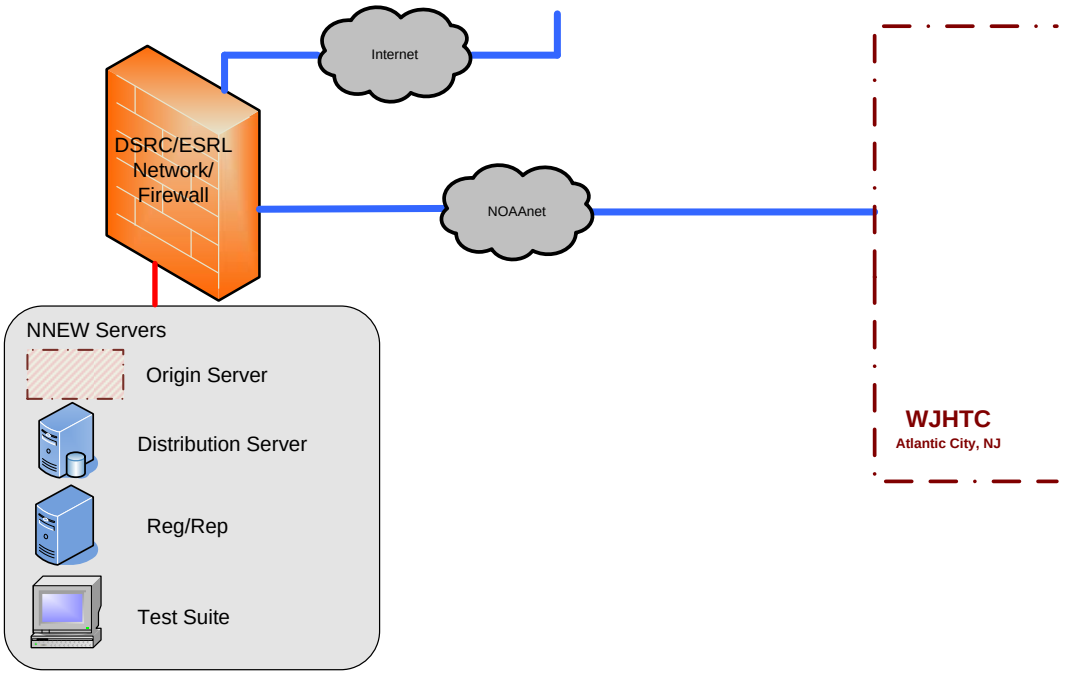

Figure 9 – GSD's FY10 Capability Evaluation Testbed Design

2.3.2 NSSL

NSSL, located in Norman, Oklahoma, works to improve the lead time and accuracy of severe weather warnings and forecasts in order to save lives and reduce property damage. NSSL works to understand the causes of severe weather and explore new ways to use weather information to assist NWS forecasters and Federal, university, and private sector partners.

Applied research at NSSL focuses on understanding severe weather processes, developing weather observation technology, and improving forecast tools, with emphasis on weather radar, hydrometeorology, and forecast/warning improvements. NSSL will be participating in the Capability Evaluation, bringing in a large set of innovative products—some not seen in previous demonstrations. These data sets will be converted from their native NetCDF WDSS II format into the NextGen standard NetCDF CF format by NSSL and the WJHTC. This set includes a 30-min forecast composite reflectivity mosaic (0-60k ft) and a 30-min forecast VIL. In addition, they will contribute radar reflectivity mosaics (at a rich set of flight levels), plus products for lightning probability, shear, hail, precipitation, echo tops, VIL, and more. Appendix F shows a set of NSSL products that are prioritized as primary and secondary for inclusion in the Capability Evaluation. NSSL, GSD, and WJHTC are working together to enable access

to NSSL's products via GSD's WCS as a possible backup connection.

NSSL's network connection for this Capability Evaluation will be through a dedicated NOAAnet connection (2 T1's). NSSL/GSD network will be used as a backup connection through the NOAA Boulder NOC (via a 10GE connection from NSSL to Oklahoma, and then Internet1 or Internet2 to GSD). See Figure 10 for NSSL's architecture in support of the FY10 Capability Evaluation.

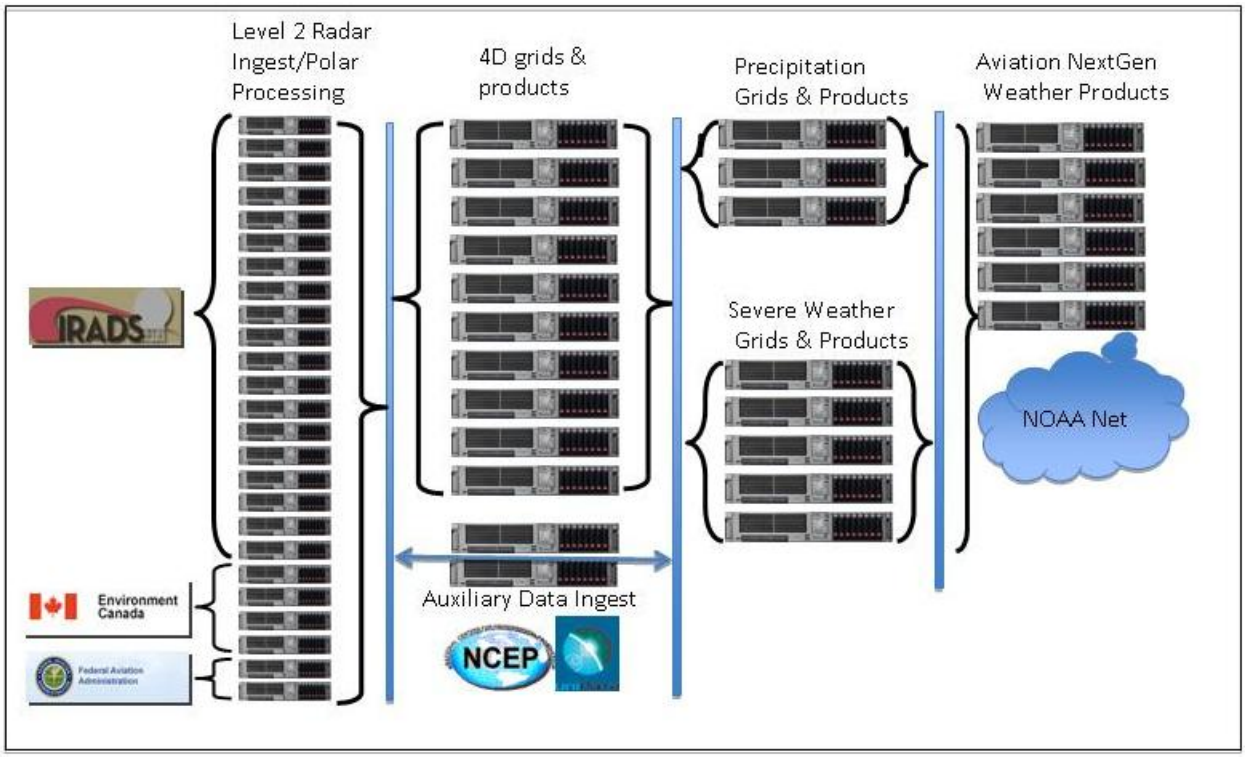

Figure 10 – NSSL in FY10 Capability Evaluation

2.4 MIT/LL

As shown in the Figure 11, MIT/LL will contribute a reg/rep for data set discovery, a WFS server for dissemination of non-gridded data, and a WCS server for disseminating gridded data. These will be connected to the FAA WJHTC facility via an FTI gateway that provides a secure path from Internet2 to the weather R&D enclave. Access to external users on the Internet will continue to be provided via a separate path, but will not be used for the core demonstration in the R&D enclave.

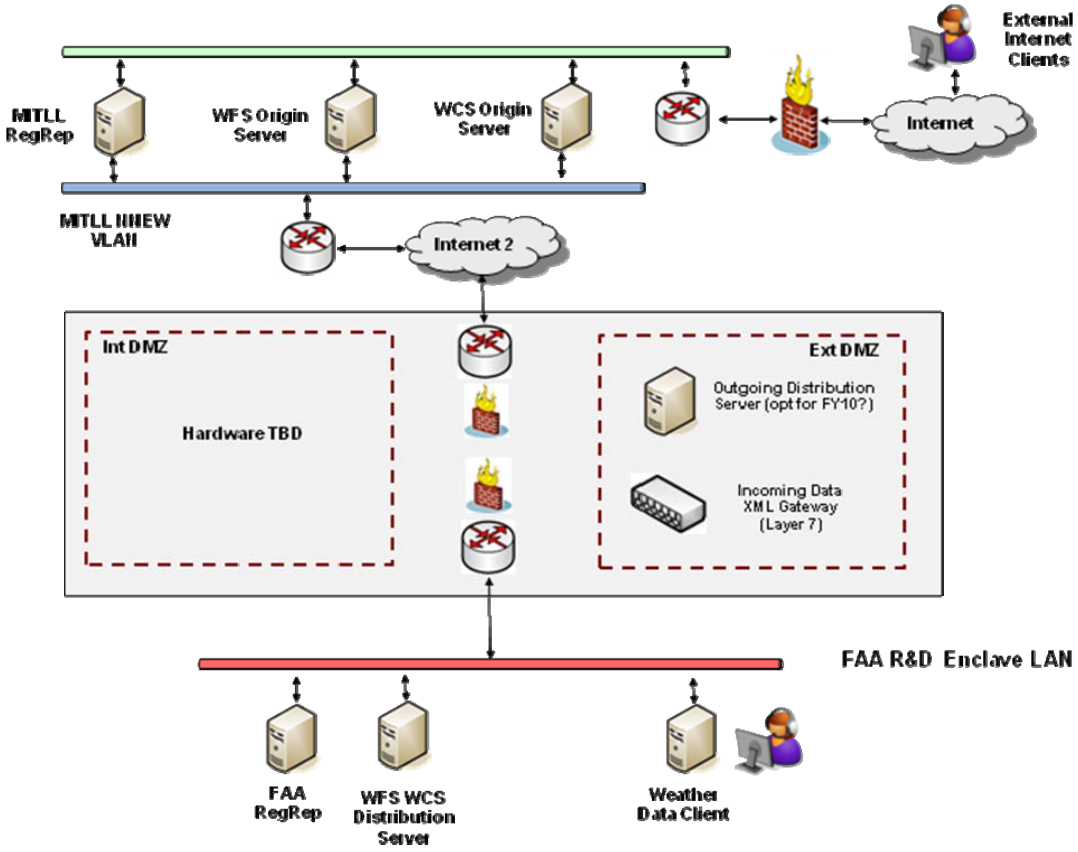

Figure 11 – MIT/LL's FY10 Capability Evaluation Architecture

The servers (WCS and WFS servers) at MIT/LL will serve as the origin servers for the following Corridor Integrated Weather System (CIWS) gridded and non-gridded data sets:

CIWS Gridded Data Sets:

- Current CONUS Precip (VIL) Dataset
- Current CONUS Quantized Precip (VIL) Dataset
- Forecast CONUS Precip (VIL) Dataset
- Forecast CONUS Quantized Precip (VIL) Dataset
- Current CONUS Echo Top Dataset
- Current CONUS Quantized Echo Top Dataset
- Forecast CONUS Echo Top Dataset
- Forecast CONUS Quantized Echo Top Dataset
- Current CONUS Satellite Dataset

CIWS Non-Gridded Data Sets:

- Current Growth & Decay Trends Dataset
- Current Storm Echo Top Tags Dataset
- Current & Forecast Storm Leading Edge Positions Dataset
- Current Storm Motion Vectors Dataset
- Forecast Standard-Mode Precip (VIL) Contours Dataset

- Forecast Winter-Mode Precip (VIL) Contours Dataset
- Forecast Echo Tops Contours Dataset
- Echo Tops Forecast Accuracy Scores Dataset
- Standard-Mode Precip (VIL) Forecast Accuracy Scores Dataset
- Winter-Mode Precip (VIL) Forecast Accuracy Scores Dataset
- Current Lightning Flash Dataset

Appropriate metadata and discovery information for the datasets and servers will be hosted by the MIT/LL reg/rep. The information will be discoverable and accessible via an NCAR NNEW display client running inside the R&D enclave.

In addition to demonstrations of end-to-end data access, a number of the monitoring and logging features of the WFSRI will be demonstrated, using the SWIM FUSE HQ product.

The registries at MIT/LL, NWS, GSD, and WJHTC will provide discovery metadata “in the background” for many of the evaluation scenarios. MIT/LL will explicitly demonstrate registry features in more detail using the registry user interface. The evaluation will include publishing a dataset and an associated service, publishing a Cube-domain taxonomy, federated discovery across multiple registries, and fault tolerance.

2.5 NCAR

The Research Applications Laboratories (RAL) at the NCAR in Boulder, Colorado develops solutions for a wide range of aviation users' weather needs. RAL's current research and development emphases are: in-flight icing; snowfall and freezing precipitation; convective storm nowcasting and forecasting; atmospheric turbulence; numerical weather prediction; remote sensing; data assimilation; precipitation physics; ceiling and visibility; oceanic weather; verification methods; and data dissemination via the 4-D weather data cube. RAL's work tends to be heavily oriented toward real-time operational systems and this focus leads to an emphasis on algorithm development, specialized graphical displays, systems engineering, operational demonstrations, and the associated scientific validations and user-oriented evaluations.

RAL is a major collaborator in the development of the Cube. RAL has focused on development of: 4-D Weather Data Cube data format and protocol standards, gridded data distribution via an Open Geospatial Consortium (OGC) WCSRI, simplified client data access via the Wx Data Consumer library, and the NNEW Display Client.

For the FY10 Capability Evaluation, NCAR will be providing the following live feeds of gridded/WCSRI 2.0 products over the public Internet, with appropriate information placed in the Registry/Repository:

- RUC (air temperature, humidity, winds, etc.)
- GTG (Turbulence)
- CIP/FIP (Icing)
- Ceiling
- Visibility
- Flight Category
- NCWF (Convection)
- GFS (world-wide)

NCAR will also be providing the following live feeds of non-gridded/WFSRI 2.0 products over the public Internet:

- METARs
- PIREPs
- TAFs
- AIRMETs
- SIGMETs
- CCFP (convective forecasts)
- G-AIRMETs

NCAR will be providing the following live feeds of non-gridded/WFS product over Internet 2/VPN to the WJHTC:

- PIREPs

For this product, NCAR will be acting as a WFSRI origin server, which will feed a WFSRI distribution server at the FAA WJHTC. This is an initial capability evaluation of origin/distribution server configurations, and is a first step at proving the scalable aspects of the system. It is currently envisioned that there will be a middleman component in the External DMZ to meet FTI and FAA WJHTC security requirements, most likely an XML/HTTP gateway.

NCAR will also be providing the NNEW display client that uses the Cube system to display all products available through OGC services in the FY10 Capability Evaluation. Outside the WJHTC, the NNEW display client will not be capable of displaying data from services inside the WJHTC because of networking and security restrictions. This display client provides basic geographic retrieval and display, corridors/cross sections, animation, a visualization of the 4-D Wx Data Cube discovery and retrieval process, and a number of other capabilities.

In accordance with NCAR's role in developing the WCSRI, NCAR may also provide a number of other capabilities to demonstrate more technical aspects of FY10 WCSRI development, for example, monitoring visualizations, logging parsers, low-level data access utilities, etc.

Figure 12 shows the architectural layout that will be present at NCAR for the Evaluation.

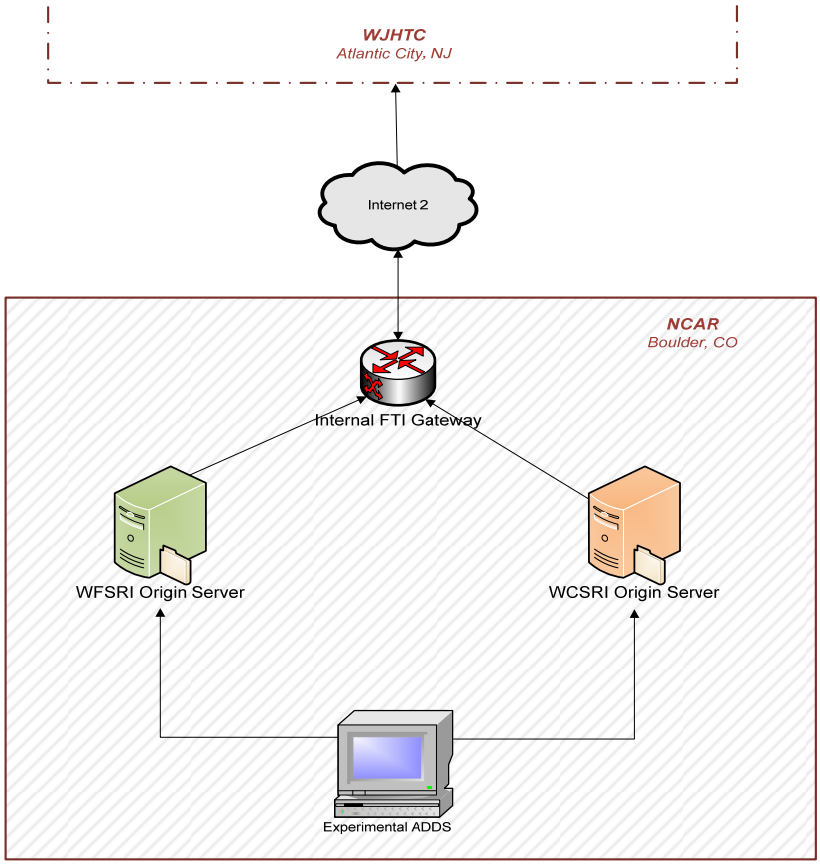

Figure 12 – NCAR's FY10 Capability Evaluation Architecture

2.6 AIM

The FAA has established a plan to collect, evaluate, process, and disseminate accurate, complete, and timely data for airports. The AIM Group within the Air Traffic Organization (ATO) is developing a centralized Geographic Information System (GIS) to manage digital airport information. This Airports GIS (AGIS) system collects airport survey data and imagery under joint authority with the Office of Airports (ARP), as well as airport information from various sources such as the National Geospatial-Intelligence Agency (NGA) and the National Airspace System Resources (NASR). For the purposes of the FY10 NNEW Capability Evaluation, AIM will use the AGIS to publish data.

2.6.1 Systems and Services

The Web service capabilities for distributing airport data will be supported by the core system architecture of AGIS. The AGIS system components shown in Figure 2.2.1 operate using Java Servlet and JavaServer Pages technologies via standard protocols such as Hypertext Transfer Protocol (HTTP), Simple Object Access Protocol (SOAP), and Secure Sockets Layer. The AGIS system supports Web services that operate using OGC standards for map, feature, and coverage data, and the Keyhole Markup Language (KML) file format. The AGIS system will provide AIXM data using Web Services Description Language (WSDL) and the Representational State Transfer (REST) architectural style. Any FAA system or user, as well as external systems or users, such as commercial or industrial customers who require access to the data, can request and receive data through these Web services.

Primary data management activities of AGIS include the submission, verification, and dissemination of airport survey data collected according to data standards established by ARP. AGIS also integrates data

that it either collects or accesses from various systems. The connections with NASR and the National Aeronautical Charting Office (NACO), shown in Figure 13, are systems that AGIS accesses periodically to retrieve data that it also provides to its users.

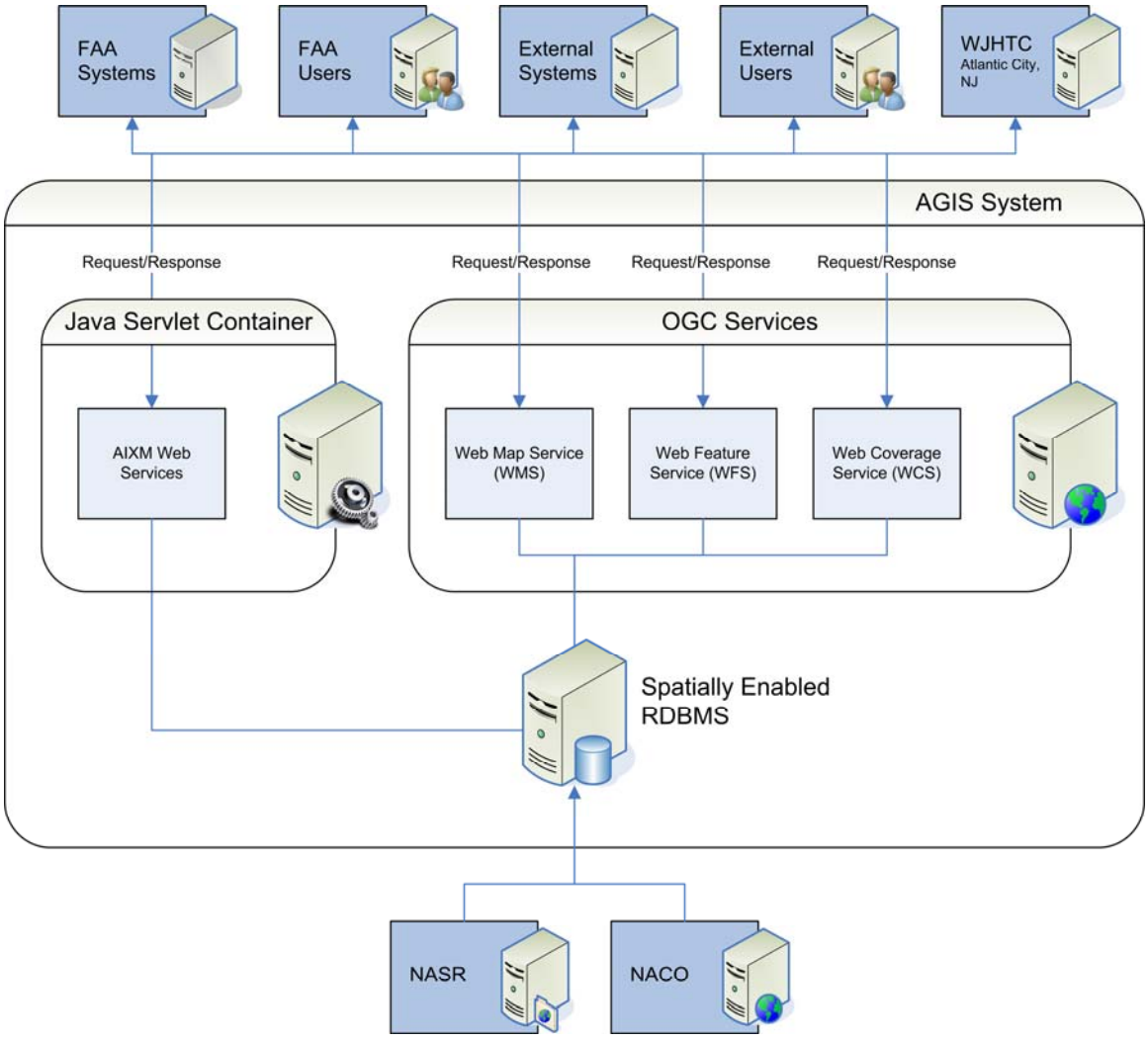

Figure 13-- AGIS Web services system components

2.6.2 AIXM Services

A major capability is to distribute airport data in an exchange format that will be supported by US and international organizations including the FAA, ICAO, NGA, and EUROCONTROL. The AGIS system can transform the features, attributes, and enumerations collected as survey data into AIXM format; AIXM 5.1 is the current version and will be supported by AGIS. The AGIS data model was derived from the AirMAT data standard, which is part of the Federal Geographic Data Committee (FGDC) Framework Data Standard. In combination with the FGDC extension within the AIXM model, most of the features in AGIS are able to map to AIXM. Any gaps between the AGIS and AIXM data models may be addressed by developing an extension to the AIXM data model. Future development efforts will be made to extend the AIXM model, either through the core model or an extension, to include all essential airport data from the AGIS data model. By distributing data in the universal AIXM format rather than the internal

AGIS format, AGIS facilitates efficient and accurate data exchange among FAA systems, users, and external customers.

Additionally, the plan is also to demonstrate the capability of both distributing data but also constructing products from that data. To that end, the AGIS system also distributes graphical charts meant for visualization.

2.7 EUROCONTROL

TBD

3 Performance and Latency Measurement

3.1 FY10 Metrics Baselined

For this year's Capability Evaluation, metrics will be recorded related to the system performance on each of the reference implementations (for both origin and distribution servers) and also on the reg / rep. Metrics will also be recorded to describe data flow latencies across the various network hops between endpoints. It should be noted that there are currently no formal latency or performance requirements, so for FY10 the metrics gathered will provide a baseline of system performance.

MIT/LL and NCAR are creating a software stack to enable low-level monitoring of their respective OGC web services. This will provide a way to measure performance of the reference implementation components of the Cube–request processing time. In addition, system utilization metrics may be obtained on these reference implementations to determine whether things such as CPU, memory, or disk I/O are introducing any bottlenecks into the Cube.

GSD is developing a web application that will monitor the performance of the system as a whole – i.e., end-to-end integration testing of the Cube. This is the way a typical user would experience the software. For a consumer, this will involve a round trip to the reg/rep followed by round trips to the WFS or WCS. The performance metrics will be recorded and stored in a central database and displayed in the form of graphs/charts. The tests would be based on required use cases, so the round trip times may include a GetCapabilites request, DescribeGetFeatures requests, GetCoverage requests, specific domains, times, etc.

The interpretation of these results could identify a need to make changes to the system in order to improve performance, or to send alerts if a specified threshold is met. For example, in a previous implementation of a WFS, tests confirmed that it took approximately 12 seconds to deliver the data from a single request for one hour of METAR data over the CONUS (approximately 2300 METARs). This delivery time was due to system performance rather than network latency.

4 Security

The role of the Cube is to provide universal access to aviation weather information in a net-enabled fashion. This single source of accessing weather data requires the coordination of and access to databases within the FAA, NOAA, and possibly the Department of Defense (DoD). Moving forward with this approach requires a greater perspective on security that protects not only the Cube, but the underlying participating data providers (e.g., FAA, NOAA, & DoD). Security from this perspective cannot be the view of one participating party but a collaborative view that focuses on a collaborative definition of Cube security requirements, architecture, and technology. In consideration of this effort, the NNEW security team is in collaboration with the NOAA security team to define some outlining approaches for the Cube that capture NIST guidance, agency policy, security architecture design, and relevant security technologies.

In greater detail, the FAA and NOAA security teams are working on a collaborative effort to demonstrate these capabilities during the FY10 Capability Evaluation. The following explanations will describe the collaborative efforts made by the FAA and NOAA to apply a security design and its associated security technologies. These security efforts capture the Cube at its current level of system development.

4.1 Security Design and Architecture

The Federal Information Security Management Act (FISMA) of 2002 recognizes the importance of information security to the economic and national security interests. FISMA has mandated a set of minimum security standards documented within the FIPS and NIST special publications.
Figure 14 illustrates the specific activities in the Risk Management Framework and information security standards and guidance documents associated with each activity.

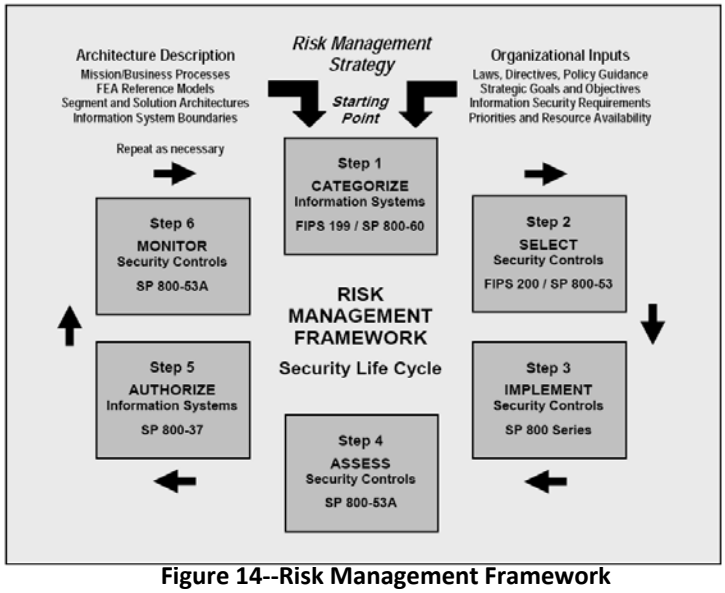

Figure 14--Risk Management Framework

The FAA and NOAA security team is currently in Step 2, Select Security Controls. For the FY10 Capability Evaluation, the security team will demonstrate access controls within the Cube through the Web Services Security (WSS) implementation within the SOA.

Access controls can be demonstrated by the use of WSS implementation between WCSRI and WCS client systems. For the WCS client the web services client under development for NWP will be used. On the provider side WSS provisions available in the SWIM container will be enabled. The WCS client is being developed using the Spring Framework, where the Spring-WS security provisions will be enabled.

4.2 Supporting Security Technologies

One of the security objectives for the FY10 Capability Evaluation is to demonstrate some of the security technologies that support secure, interagency communications. Based on collaborative efforts between the FAA and NOAA security team, it was determined that an XML gateway may provide the benefits of secure, interagency communications within the overall Cube Service Oriented Architecture.

In the FY10 Evaluation, the primary security objective of the XML gateway will be to support transport layer proxies. The XML gateway will be configured to proxy all incoming and outgoing data flows to and from Cube providers and consumers through Internet, Internet2, and NOAAnet connections. An example of this data flow with the XML gateway in loop can be seen in Figure 2.

The secondary security objective of the XML gateway is to demonstrate application filtering within the Cube. The XML gateway policies must be configured for application-level filtering and tested to ensure the security policies are enforced and are working correctly. The results of these tests would then be presented or demonstrated at the FY10 Capability Evaluation in a presentation form.

5 Capability Evaluation Test & Evaluation Procedures

5.1 Overview

The Capability Evaluation Test and Evaluation Procedures will be developed to support the primary and secondary objectives of this year's Capability Evaluation described in section 1.3, and will be based on the requirements listed in section 1.4.

5.2 Testing/Evaluation Areas

Test procedures will be provided for a variety of testing areas, in order to exercise and evaluate the Cube functionality provided for FY10.

- Functional testing of Version 2 of the WCSRI and WFSRI: the test and evaluation procedures in this area will verify that the RIs satisfy the Version 2 requirements listed in Appendix B. Regression testing of Version 1 requirements will also be included.
- End-to-end system testing: procedures in this area will verify that the system components can be successfully installed and that they work together as expected.
- Reg/Rep federation evaluation: testing in this area will exercise and evaluate the federation capabilities of the reg/reps within the FY10 evaluation environment.
- Data discovery and access: procedures will be developed to verify the discovery and retrieval of the datasets listed in Appendix F, from all data providers. Service adapter testing will also be included.
- Performance and latency: system performance and latency will be evaluated, as described in section 3.
- Security: security controls and technologies will be evaluated, as described in Section 4.

5.3 Test and Evaluation Procedure Format

FAA template C-6 (see Appendix H), Development Test (DT) and Performance Acceptance Test (PAT) Procedures, will be used for documenting the FY10 Test and Evaluation procedures. Modifications may be made to the template, to tailor it to the specific needs of the Capability Evaluation. Each procedure will contain a description of the test, a description of the system or component under test, the requirements under test, step-by-step instructions with expected results, and space to indicate success or failure. A Verification Requirements Traceability Matrix (VRTM) will be implemented, based on the examples in FAA document FAA-STD-024B. The VRTM will be used to track test and evaluation results during the Capability Evaluation.

5.4 Preparation and Execution

The NNEW capabilities and the test/evaluation procedures will be verified prior to the Capability Evaluation. A continuous process of testing, issue tracking, issue resolution and re-testing will be employed in the months leading up to the Evaluation.

Two dry run testing periods have been scheduled. The initial dry run will take place at the WJHTC the week of July 26, and will involve exercising existing test procedures to gauge the progress that has been made in preparing for the Capability Evaluation. A Test Readiness Review will take place August 31, and the final dry run will take place at the WJHTC from September 1 – September 10.

The Capability Test and Evaluation will take place the week of September 13. The Test and Evaluation procedures will be executed at the WJHTC, and the results of each test will be recorded. A Quick-Look Report (template shown in Appendix I) containing a high-level summary of the proceedings will be provided, followed by a more in-depth Test Results and Analysis Report (template shown in Appendix J).

5.5 Test Readiness Review

Prior to the conduct of formal testing, a formal Test Readiness Review (TRR) is presented. At the TRR, all aspects of the system are reviewed to determine if it is ready to proceed with formal testing activities. Prior to TRR, the Test Team will conduct dry-runs of all officially approved test procedures and present all issues that were identified during the dry run to the TRR. Included with TRR, the test team will demonstrate their readiness to commence formal testing. In addition, the following areas of the NNEW program are reviewed at TRR:

- Requirements Baseline
- Software Baseline
- Hardware Baseline
- Test Environment Baseline
- Rules of Test Conduct
- Redlines to Test Procedures
- Resolution to Issues Identified during test dry-runs

The minutes from TRR will be recorded and saved for future reference.

5.6 Capability Test & Evaluation

The Capability Test will be developed to thoroughly test all applicable requirements and provide performance and latency measurements. Testing is scheduled for five days and will consist of the following:

- Testing will be conducted in the NWEC Lab at the WJHTC.
- Utilize test clients and simulation capabilities to exercise Cube components.
- Reporting and tracking of all issues will be documented in a Problem Tracking Report (PTR) form.

5.7 High-Level Capability Evaluation Presentation

For the High-Level Capability Evaluation Presentation (Presentation), it is anticipated that there will be a number of attendees who will have varying levels of background and knowledge of the Cube. Before the Presentation, a fairly comprehensive tour of the WJHTC facility will be offered for those that wish to learn more about the WJHTC. After completion of the tour, attendees will assemble in the Common Viewing Area of the WJHTC for the Presentation. The Presentation will begin with a background, history, and explanation of the NNEW Program and the NextGen Weather Information Database Program's plan to develop the Cube, followed by a high-level description of the Cube. The Cube discussion will include a description of the Cube's functionality, standards, and anticipated operational architecture. A presentation of the Capability Evaluation architecture (which will include NOAA, AIM, EUROCONTROL, and other outside FAA entities) will also be provided. There will also be a high-level discussion of the Service Adaptors that have been or are being developed: their purpose, development status, development timeline, and testing results. There will be a description of the weather products planned for IOC and those that will be included in the Presentation. Results from the Capability Test and

Evaluation will also be briefed to the attendees. Once this information has been briefed, a visual presentation will be conducted to show progress towards development of the Cube. The visual presentation itself is expected to include, although not limited to: various operational scenarios, data manipulations, subsetting of data, registry manipulation, data discovery, security, initial Single Authoritative Source capabilities, initial security, unique datasets available, and various concepts of the Cube in an operational environment.

6 Schedule

6.1 Schedule of Activities

Planning and scheduling for the FY10 Capability Evaluation will be far more involved than it has been in years past. Figure 15 below is an MS Project schedule devoted to FY10 Capability Evaluation planning. The schedule lists the key activities, deliverables, associated dates, and the responsible organization(s) for each activity.

ID	Task Name	Responsible Organization	Duration	Start	Finish
1	**FY10 Evaluation Schedule**		**163 days**	**4/30/10**	**12/15/10**
2	FY10 Capability Evaluation Plan Complete		0 days	4/30/10	4/30/10
3	Draft 1 FY10 Capability Test and Evaluation Procedures Document	ESRL	0 days	6/1/10	6/1/10
4	V2 RI Initial Release	LL,NCAR	0 days	6/1/10	6/1/10
5	Draft 2 FY10 Capability Test and Evaluation Procedures Document	ESRL	0 days	7/2/10	7/2/10
6	Test execution / bug reporting / debugging	ESRL,LL,NCAR	34 days	6/15/10	7/30/10
7	* Data provider limited capability (data provider deadline)		0 days	7/23/10	7/23/10
8	Initial Dry Run at WJHTC	ESRL,WJHTC	5 days	7/26/10	7/30/10
9	V2 RI Final release - No new functionality after this date	LL,NCAR	0 days	8/2/10	8/2/10
10	Test execution / bug reporting / debugging	All	21 days	8/2/10	8/30/10
11	NOAA Data Providers Systems Complete	NOAA	0 days	8/13/10	8/13/10
12	V2 RI code freeze; No code changes after this unless approved	LL,NCAR	0 days	8/13/10	8/13/10
13	Draft 3 FY10 Capability Test and Evaluation Procedures Document	ESRL	0 days	8/20/10	8/20/10
14	** Data provider full capability (data provider deadline)		0 days	8/20/10	8/20/10
15	NOAA Dry Runs	NOAA	10 days	8/16/10	8/27/10
16	NOAA Demo Systems Available	NOAA	0 days	8/27/10	8/27/10
17	FY10 Capability Test and Evaluation Procedures Document finalized	ESRL	0 days	8/30/10	8/30/10
18	Final update to FY10 IT Capability Evaluation Plan	WJHTC	0 days	8/30/10	8/30/10
19	Test Readiness Review	WJHTC	0 days	8/31/10	8/31/10
20	Service Adaptor Development Complete	WJHTC	0 days	9/1/10	9/1/10
21	Final Dry Run at WJHTC	All	8 days	9/1/10	9/10/10
22	FY10 Capability Test and Evaluation	All	5 days	9/13/10	9/17/10
23	FY10 Capability Evaluation Presentation		5 days	9/20/10	9/24/10
24	Quick Look Report	WJHTC	0 days	9/30/10	9/30/10
25	FY10 Capability Test and Evaluation Results and Analysis Document	ESRL	0 days	12/15/10	12/15/10

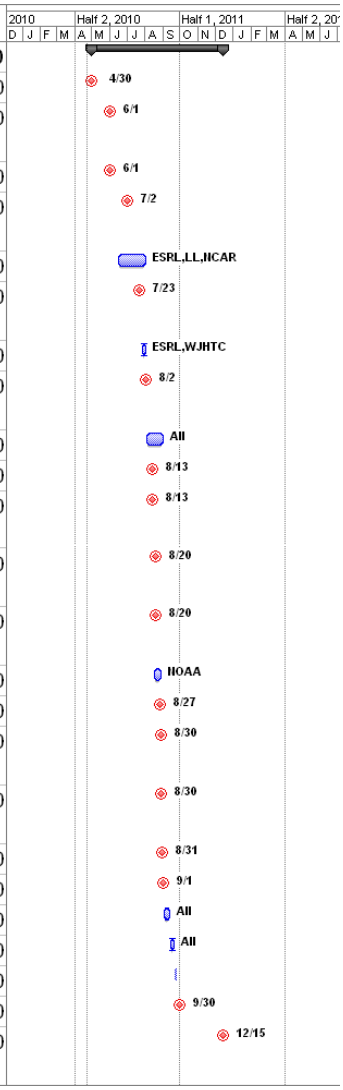

Figure 15 – FY10 Capability Evaluation Schedule

Please note the following when referring to Figure 15:

* Data providers should have a limited capability by this time, to support the initial dry run scheduled for the week of July 26 at the WJHTC. Limited capability includes:

- WFS/WCS installed and operating;

- Some datasets available (not necessarily all);
- Communications with the WJHTC established and tested.

** Data provider capabilities should be fully functional by August 20. Full capability includes:

- WFS/WCS installed and running;
- All datasets should be available;
- Testing of the WFS/WCS should be complete;
- Communications with the WJHTC established and tested.

Appendix A: Acronyms

ADAS .....AWOS Data Acquisition Systems
AIM .....Aeronautical Information Management
ANC.....AutoNowcaster
ARP .....Office of Airports
ARTCC .....Air Route Traffic Control Center
ASOS .....Automated Surface Observing System
ASR.....Airport Surveillance Radar
ATIS.....Automated Terminal Information Service
ATOP .....Advanced Technologies & Oceanic Procedures
AWC.....Aviation Weather Center
AWOS.....Automated Weather Observing System
Capability Evaluation.....FY10 4-D Weather Data Cube Capability Evaluation
CAWS .....Consolidated Aviation Web Services
CCSA.....Consumer Cube Service Adaptor
CE.....Customer Edge
CF .....Climate and Forecast
CIES .....Cube Input Edge Services
CIWS .....Corridor Integrated Weather System
COES .....Cube Output Edge Services
Cube.....4-D Weather Data Cube
DMZ .....Demilitarized Zone
DOD .....Department of Defense
DOTS .....Dynamic Ocean Tracking System
DT.....Development Test
ED-6 .....Virtual Private Network
ED-8 .....Extranet Gateway
ED-11 .....Access Control List
ESRL .....Earth System Research Laboratory
EUROCONTROL.....European Organisation for the Safety of Air Navigation
FAA .....Federal Aviation Administration
FDP2K .....Flight Data Processor 2000
FISMA.....Federal Information Security Management Act
FGDC.....Federal Geographic Data Committee
FNTB .....FTI National Testbed
FTI .....FAA Telecommunication Infrastructure
FY10 .....Fiscal Year 2010
GIS.....Geographical Information System
GSD .....Global Systems Division
HTTP .....Hypertext Transfer Protocol
IAP.....Internet Access Point
IDV .....Integrated Data Viewer
IOC .....Initial Operating Capability
JMBL .....Joint METOC Broker Language
KML.....Keyhole Markup Language
LAMP .....Localized Aviation MOS Program

LLWAS.....Low-Level Wind Shear Alert System
MADIS.....Meteorological Assimilation Data Ingest System
MDL .....Meteorological Development Laboratory
MIT/LL.....MIT's Lincoln Laboratory
NACO .....National Aeronautical Charting Office
NAS .....National Airspace System
NCAR.....National Center for Atmospheric Research
NDFD.....National Digital Forecast Database Grids
NDGD .....National Digital Guidance Database
NEXRAD .....Next Generation Weather Radar (officially designated WSR-88D)
NextGen.....Next Generation Air Transportation System
NEVS .....Network-Enabled Verification Service
NGA.....National Geospatial-Intelligence Agency
NNEW .....NextGen Network Enabled Weather
NOAA .....National Oceanic and Atmospheric Administration
NOAAnet.....NOAAnet Subaccess Network
NOC.....Network Operations Center
NOMADS.....National Operational Model Archive and Distribution System
NSSL .....National Severe Storms Laboratory
NWEC.....NextGen Weather Evaluation Capability
NWP.....NextGen Weather Processor
NWS .....National Weather Service
NWSTG .....National Weather Service Telecommunications Gateway
OGC.....Open Geospatial Consortium
OPS IP .....FAA Operational IP Network
PAT.....Performance Acceptance Test
PCSA.....Provider Cube Service Adapter
Plan .....FY10 IT Capability Evaluation Plan
Presentation .....High-Level Capability Evaluation
PTR.....Problem Tracking Report
QICP .....Qualified Internet Communications Provider
R&D.....Research and Development
RAL.....Research Applications Program
RASP.....Regional ADAS Service Processor
reg/rep.....WellGEO Registry/Repository
REST .....Representational State Transfer
RI.....Reference Implementation
RUC .....Rapid Update Cycle
R&D.....Research & Development
SEC .....System Engineering Center
SOA .....Service Oriented Architecture
SOAP .....Simple Object Access Protocol
SWIM .....System Wide Information Management
TAF.....Terminal Aerodrome Forecast
TCN .....Terrestrial Communications Network
TDWR.....Terminal Doppler Weather Radar
TRACON .....Terminal Radar Approach Control
TRR.....Test Readiness Review

VIL.....Vertically Integrated Liquid
VPN.....Virtual Private Network
VRTM.....Verification Requirements Traceability Matrix
WCS.....Web Coverage Service
WFO.....Weather Forecast Offices
WFS.....Web Feature Service
WJHTC.....William J Hughes Technical Center
WS.....Web Services
WSDL.....Web Services Description Language
WSS.....Web Services Security
WXXM.....Weather Information Exchange Model
XML.....Extensible Markup Language

Appendix B: 4-D Wx Data Cube Technical Architecture Framework

The figure below shows the Cube's Technical Architecture Framework (taken from the Draft 4-D Wx Data Cube System Specification).

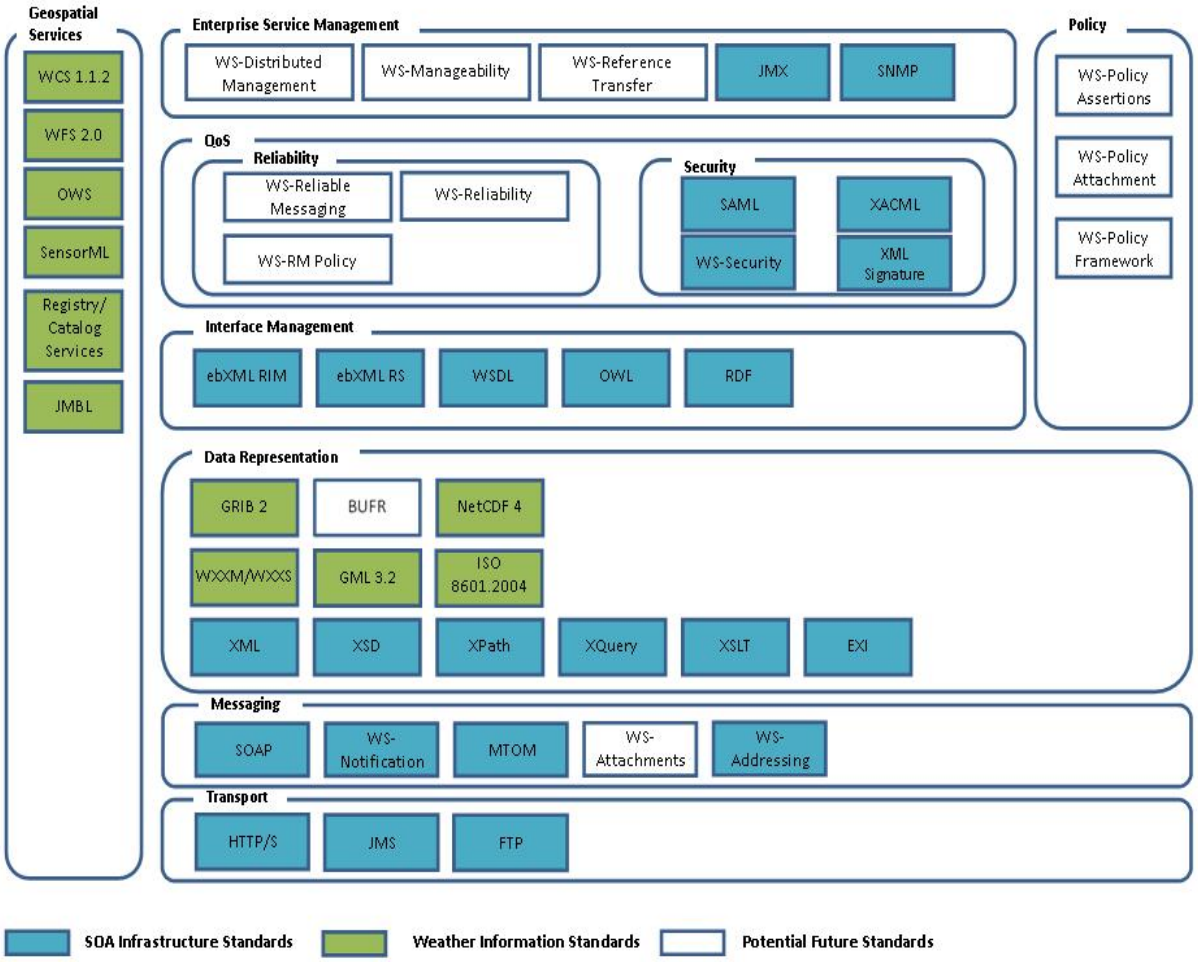

Figure 16 – 4-D Weather Data Cube Technical Architecture Framework

Appendix C: WCS/WFS Requirements

Table 3: WFSRI Requirements Table

WFS#	WFS Requirement Text	V1.0	V2.0	V3.0
4.1.1	The WFSRI shall provide the capability for the Service Provider to specify the supported features.	Finished		
4.1.2	The WFSRI shall provide the capability for the Service Provider to configure the following for each feature offered by the WFSRI: 1. Name of the feature. 2. Descriptive metadata for the feature.	Finished		
4.1.3	The WFSRI shall support the relational database data store.	Finished		
4.1.4	The WFSRI shall provide output in an ISO 19139 format.		Finished	
4.1.5	The WFSRI shall provide a lifecycle management system that will delete data beyond a certain time period or archive data for a specified period of time.			Finished
4.2.1	The WFSRI shall allow subsetting by zero or more fields (e.g., temperature, reflectivity). If no fields are indicated, all available fields shall be returned. All fields specified as mandatory by the data provider will be returned, irrespective of the user request. The mandatory fields will be specified by the data provider at the time of registration of the feature type.	Start	Finished	
4.2.1.1	The WFSRI shall support geometric filtering of features, including the following:	Finished		
	- 3D Volume. For this case, a 3-dimensional bounding box may be specified with dimensions defined by X, Y, Z value (such as latitude, longitude and altitude) ranges. A user can query for data that coincides with this volume.		Finished	
	- Horizontal 2-D Cross-section. If a constant altitude level is specified, a horizontal (latitude/longitude) slice will be taken through the feature volume.	Finished		
	- Vertical 2-D Cross-section. For this case, a vertical slice is taken through a feature. The path for the cross-section is defined by a set of XY waypoints and a sample density.	Finished		
	- Sounding. A feature may be subsetted by requesting a vertical column of data whose location is specified by a latitude/longitude point.		Finished	

WFS#	WFS Requirement Text	V1.0	V2.0	V3.0
	- Point. A feature may be subsetted by requesting a single point specified by X, Y, and Z values.	Finished		
	- Trajectory. A feature may be subsetted along a trajectory, or a 3-D path, by specifying the latitudes, longitudes and altitudes of two or more ordered waypoints. The returned feature will be a "line" of data along a 3-D path, where the geo-locations of the interpolated data points are determined with either Euclidean or Great Circle geometry.			Finished
	- Corridor. A feature may be subsetted by extruding a rectangular area along a trajectory. A rectangular cross-section, orthogonal to and along a trajectory can be extracted from the feature volume by specifying the two or more ordered waypoints, the vertical range and the horizontal range. This rectangular cross-section is a corridor. In addition, this is a superset of the horizontal and vertical cross-sections, and may be used for cross-section subsetting.			Finished
4.2.1.2	The WFSRI shall provide support for arbitrary geometric subsetting beyond rectangular bounding boxes.			Finished
4.2.2.1	The WFSRI shall be capable of providing a list of valid times from datasets that are temporally aggregated.		Finished	
4.2.2.2	The WFSRI shall provide the capability to constrain features by requesting a single valid time.	Finished		
4.2.2.3	The WFSRI shall provide the capability to constrain features by requesting a range of valid times.	Finished		
4.2.2.4	The WFSRI shall provide the capability to constrain features by requesting additional time constraints such as transaction time and request time, for accident reconstruction.			Finished
4.3.1	The WFSRI shall require the use of GML(OGC 03-105R1) to express features within the interface and at a minimum, be used to present features. The GML version will conform to the version specified in WFS specification.	Finished		
4.3.3	The WFSRI shall support WXXM 1.1 encodings of XML as input and output formats.	Finished		
4.3.4	The WFSRI shall support an efficient XML encoding of WXXM 1.1 output.			Finished
5.0.1	The WFSRI shall support the WFS version 1.1.0 /2.0 specifications.	Start	Finished	
5.0.2	The WFSRI shall be designed to support future WFS specification versions.		Finished	

WFS#	WFS Requirement Text	V1.0	V2.0	V3.0
5.0.3	The WFSRI shall support version negotiation as outlined in the WFS 1.1.0 specification.			Finished
5.1.1	The WFSRI shall provide support for the European Petroleum Survey Group (EPSG) CRS. The 4-D Wx Data Cube Registry/Repository will likely contain these definitions.		Finished	
5.1.2	The WFSRI shall allow the user to request a CRS that is not the default and is supported by the WFSRI.			Finished
5.1.3	The WFSRI shall return data using the default CRS if no CRS is specified.	Finished		
5.1.4	The WFSRI shall use Uniform Resource Locators (URL) wherever it is appropriate for CRS identifiers.	Finished		
5.2.1	The WFSRI shall provide a means for the Service Provider to enable/disable the WFS operations by encoding type. (For example, the Service Provider may wish to disable POX-style WFS operations.)			Finished
5.3.1.1	The WFSRI shall support Key-Value Pair (KVP) encoding over HTTP GET for the GetCapabilities operation.			Finished
5.3.1.2	The WFSRI shall support Plain Old XML (POX) encoding over HTTP POST for the GetCapabilities operation.	Finished		
5.3.1.3	The WFSRI shall support Simple Object Access Protocol (SOAP) encoding over HTTP POST for the GetCapabilities operation.			Finished
5.3.2.1	The WFSRI shall provide an XML document indicating services, capabilities and features.	Finished		
5.3.3.1	The WFSRI shall support Key-Value Pair (KVP) encoding over HTTP GET for the DescribeFeature request.			Finished
5.3.3.2	The WFSRI shall support Plain Old XML (POX) encoding over HTTP POST for the DescribeFeature request.	Finished		
5.3.3.3	The WFSRI shall support Simple Object Access Protocol (SOAP) encoding over HTTP POST for the DescribeFeature request.			Finished
5.3.4.1	The WFSRI shall initially provide an XML document in GML 3.1 or 3.2. If no version of GML is indicated, a default version corresponding to the most recent WFS specification is to be used.	Start	Finished	
5.3.5.1	For the GetFeature operation, the WFSRI shall support Plain Old XML (POX) encoding over HTTP POST.	Finished		
5.3.5.2	For the GetFeature operation, the WFSRI shall support Simple Object Access			Finished

WFS#	WFS Requirement Text	V1.0	V2.0	V3.0
	Protocol (SOAP) encoding over HTTP POST.			
5.3.6.1	The WFSRI shall provide an XML document containing the feature member elements for each requested feature.	Finished		
6.0	The WFSRI installation shall include, a description of the procedure for adding and removing offered feature types, and updating the metadata for those feature types.	Finished		
6.1.1	The WFSRI shall provide an event-based mechanism to distribute filtered data (such as geometric and temporal subsets) to interested data consumers as the data arrives in near real-time. The mechanism used here shall be consistent with what is used by other 4-D Wx Data Cube fundamental components, such as the WCSRI, to distribute filtered		Finished	
6.1.2	The WFSRI shall enable guaranteed delivery of data and/or notifications that are pushed to data consumers.		Start	Finished
6.2.1	The WFSRI shall be capable of acting as a consumer of WFSRI services.		Finished	
6.2.2	Request delegation – The WFSRI shall be capable of acting as a proxy or request delegate to another upstream WFSRI.		Finished	
6.2.3	Dataset aggregation - The WFSRI shall be capable of aggregating two or more upstream WFSRI datasets into a single (aggregate) logical dataset which is stored locally.		Finished	
6.2.4	Filtered data push - The WFSRI shall be capable of acting as a consumer of one or more upstream WFSRIs using their data push mechanism to cache data locally.		Finished	
6.2.5	Caching request delegation - The WFSRI shall be capable of acting as a consumer of one or more upstream WFSRIs using their request/response data services and caching data or subsets of data locally as necessary.		Finished	
6.2.6	The WFSRI shall provide the capability to configure a variety of architectural patterns on a product-by-product basis (i.e., different features may warrant different WFSRI communication patterns). Those patterns are described above and include delegation, aggregation, filtered data push, ad-hoc data cache, etc.			Finished
6.3.1	The WFSRI shall support the WFS-Transaction protocol to allow Service Providers to publish data to the WFS server	Finished		
6.3.2	The WFSRI shall provide support infrastructure to enable Service Providers to		Finished	

WFS#	WFS Requirement Text	V1.0	V2.0	V3.0
	create the appropriate relations for storing feature data, if desired			
6.4.1	The WFSRI shall provide a mechanism for describing metadata.		Finished	
6.5.1	The WFSRI shall provide remotely accessible monitoring information relating to the configuration status, WFSRI service status, health of upstream and downstream WFSRI node interactions, dataset availability, data storage size, data availability, data scrubbing information, web service request counts, web service performance, and error tracking/reporting. This capability shall be configurable to permit different levels of monitoring detail and will leverage the SWIM monitoring infrastructure.		Finished	
6.5.2	The WFSRI shall be capable of notifying Service Providers or system maintainers of critical errors in realtime or near-realtime. This may be through email, notifications, or other means. This may be implemented based on SWIM mechanisms.		Finished	
6.6.1	The WFSRI shall provide auditing capabilities that allows an authorized client to gather historical (i.e., 15 days minimum) information regarding system usage and health. This information will include request/response details.		Finished	
6.6.2	The WFSRI shall provide the capability to “duplicate” a request and its precise response (including the data), for a rolling configurable time period.		Finished	
6.7.1	The WFSRI shall provide the capability to configure the level of logging and specifics as to what is logged. This will be consistent with SWIM infrastructure and other 4-D Wx Data Cube components.		Finished	
6.7.2	The WFSRI shall record information sufficient to support audit reporting. The information and mechanism for logging shall be consistent with SWIM infrastructure and other 4-D Wx Data Cube components.		Finished	
6.8.1	The WFSRI shall perform data validation for communications, including but not limited to requests for data and messages/notifications sent from upstream nodes.			Finished
6.8.2	The WFSRI shall be compliant with the 4-D Wx Data Cube security policies and implementation(s), if these are available.			Finished
6.8.3	The WFSRI shall provide configurable role-based access to WFSRI web service endpoints. Implementation of this requirement will leverage SWIM infrastructure security solutions.			Finished
6.8.4	The WFSRI shall provide configurable role-based access to WFSRI-offered	Start		Finished

WFS#	WFS Requirement Text	V1.0	V2.0	V3.0
	features and their data fields. Implementation of this requirement will leverage SWIM infrastructure security solutions.			
6.8.5	The WFSRI shall provide security credentials (i.e. a user, group, or role) to interact with upstream and/or downstream WFSRI data providers and consumers. This information shall be configurable by the Service Provider. Implementation of this requirement will leverage SWIM infrastructure security solutions.			Finished
7.1	The WFSRI shall implement infrastructure capabilities in a manner compliant with the SWIM service container, and shall leverage SWIM mechanisms wherever appropriate.		Finished	
7.2	The WFSRI installation shall include WSDL definitions of the web services that it provides.	Finished		
7.3	The WFSRI shall support the deployment and installation of the WFS operations (e.g., GetCapabilities, DescribeFeatureType, GetFeature into the SWIM service container, either through installation scripts or documentation for Service Providers.	Finished		
8.1	The WFSRI shall run on Linux and Windows platforms.	Start		Finished
9.1	The WFSRI shall provide a flexible means to add new data formats for native data storage.		Finished	
9.2	The WFSRI shall provide a flexible means to add new data formats at the interface level.		Finished	
9.3	The WFSRI shall allow for two versions of the WFSRI to be run concurrently. This allows users to continue using the current version while making necessary changes to accommodate the newest version.			Finished
10.1	The WFSRI shall be capable of running a self-test diagnostic following installation. Canned datasets and default configurations will be provided with the software release for that purpose. A separate test document will specify these diagnostic tests.			Finished
10.2	The WFSRI shall include or allow the use of WS-I compliance-checking tools.			Finished

Table 4: WCSRI Requirements Table

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
4.1.1	The WCSRI shall provide the capability for the Service Provider to specify the available coverages or datasets that will be served by the WCSRI.	Start	Finished	
4.1.2	The WCSRI shall provide the capability for the Service Provider to configure the following for each dataset offered by the WCSRI: 1. A unique identifier for the coverage. 2. Name of the coverage. 3. The directory for the coverage data files. 4. Descriptive metadata for the dataset.	Start	Finished	
4.1.3	The WCSRI shall provide the capability to serve virtually aggregated datasets	Start		Finished
4.1.4	The WCSRI shall provide configuration capability for required information regarding the files that comprise an aggregated dataset, such as file storage directories, file names and geographic extents (in the case of tiling)	Start		Finished
4.1.5	The WCSRI shall provide a lifecycle management system that will delete data beyond a certain time period or archive data for a specified period of time	Start	Finished	
4.2.1	The WCSRI shall allow subsetting by zero or more fields (e.g., temperature, reflectivity). If no fields are indicated, all available fields shall be returned	Finished		
4.2.1.1	The WCSRI shall support geometric subsetting of coverage volumes, including the following: • 3-D Volume • Horizontal 2-D Cross-section • Vertical 2-D Cross-section • Sounding • 1-D Point • Trajectory • Corridor	Start		Finished
4.2.1.2	The WCSRI shall allow subsetting by arbitrary 3-dimensional spatial volumes (such as an air traffic control sector)	Start		Finished
4.2.2.1	The WCSRI shall provide the capability of retrieving coverage subsets with a resolution that may differ from the native grid resolution. Re-gridding will be done using nearest neighbor interpolation wherever appropriate	Start		Finished

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
4.2.2.2	The WCSRI shall support a variety of geographic projections (including projection-specific parameterizations such as projection origin, standard latitudes, etc.) for native data files, and applicable re-projection capability for the following minimum set of projections: ▪ Lambert Conformal Conic ▪ Lat/Lon ▪ Mercator ▪ Stereographic (including polar) ▪ Polar Radar ▪ NAS Projection (i.e., NAS Plane)	Start		Finished
4.2.2.3	The WCSRI shall support the following set of measures of height, and conversions among them: ▪ Flight Level ▪ Meters – above mean sea level (MSL) ▪ Feet – above ground level (AGL) ▪ Feet – above mean sea level (MSL) ▪ Standard Pressure	Start		Finished
4.2.3.1	The WCSRI shall be capable of providing a list of valid times from datasets that are temporally aggregated	Finished		
4.2.3.2	The WCSRI shall provide the capability to constrain coverages by requesting a single valid time	Finished		
4.2.3.3	The WCSRI shall provide the capability to constrain a coverage by an analysis time and valid time combination (e.g., retrieve a coverage subset that was generated as part of the 12:00Z model run cycle, and is valid for 14:00Z)		Finished	
4.2.4.1	The WCSRI shall provide the capability to aggregate coverages over valid time resulting in a time series of coverages for a given set of constraints (e.g., geometry of temperature)	Start		Finished
4.2.5.1	The WCSRI shall support temporal trajectories for trajectory-related geometries (e.g., trajectory, corridor, etc)	Start	Finished	
4.3.1	The WCSRI shall support CF-NetCDF4 as a native file format	Finished		

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
4.3.2	The WCSRI shall expose CF-NetCDF4 as a file format at the protocol level	Finished		
4.3.3	The WCSRI shall support GRIB2 as a native file format	Finished		
4.3.4	The WCSRI shall expose GRIB2 as a file format at the protocol level		Start	Finished
5.1	The WCSRI shall support the WCS version 1.1.2 specification	Start		Finished
5.2	The WCSRI shall be designed in a manner such that future WCS specification versions are supported through a pluggable protocol layer	Finished		
5.3	The WCSRI shall support version negotiation as outlined in the WCS 1.1.2 specification	Start		Finished
5.1.1	The WCSRI shall provide electronic definitions of the coordinate reference systems (CRS) that are used by the implementation wherever it is appropriate	Start		Finished
5.1.2	The WCSRI shall use Uniform Resource Locators (URL) wherever it is appropriate for coordinate reference system (CRS) identifiers	Start		Finished
5.1.3	The WCSRI shall provide electronic definitions, identified by Uniform Resource Locators (URL), for the compound coordinate reference systems used by the WCSRI implementation wherever it is appropriate	Start		Finished
5.1.4	The WCSRI shall support coordinate reference system (CRS) parameterization	Start		Finished
5.2.1	The WCSRI shall provide a means for the Service Provider to enable/disable the WCS operations by encoding type	Start	Finished	
5.3.1	The WCSRI shall support Key-Value Pair (KVP) encoding over http GET for the GetCapabilities operation	Start	Finished	
5.3.2	For the GetCapabilities operation, the WCSRI shall support SOAP encoding over HTTP POST	Finished		
5.3.3	The WCSRI shall support the `Sections` parameters	Start	Finished	
5.4.1.1	The WCSRI shall provide a means for the Service Provider to statically configure metadata describing the server for the following GetCapabilities elements: `ServiceIdentification`, `ServiceProvider`, `OperationsMetadata` and `Contents`	Start	Finished	
5.4.2.1	The WCSRI shall provide a means for the Service Provider to statically configure the endpoints for the GetCapabilities, DescribeCoverage and GetCoverage web services, for KVP, SOAP	Start	Finished	
5.4.3.1	The WCSRI shall provide a means for the Service Provider to configure the path for storing temporary files and scrubbing instructions (e.g., maximum file	Start	Finished	

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
	age) for stored request results and other temporary file purposes			
5.4.4.1	The WCSRI shall provide the capability to determine the following, on a per-coverage basis, either through programmatic means or Service Provider configuration: ▪ Unique Coverage Identifier ▪ World Geodetic System 1984 (WGS84) Bounding Box for the coverage ▪ Supported coordinate reference systems (CRS), including geographic projections, vertical and compound. ▪ Native CRS	Start	Finished	
5.4.4.2	The WCSRI shall support "application/x-NetCDF" as the value for the `supportedFormat` attribute. This is the Multipurpose Internet Mail Extensions (MIME) type for CF-NetCDF4 binary coverage data	Finished		
5.4.4.3	The WCSRI shall support the Multipurpose Internet Mail Extensions (MIME) type for GRIB2 binary coverage data as an optional value for the `supportedFormat` attribute		Start	Finished
5.5.1	For the DescribeCoverage operation, the WCSRI shall support SOAP encoding over HTTP POST	Finished		
5.6.2.1	The WCSRI shall provide a means for the Service Provider to configure metadata for each of the fields within each offered coverage	Start	Finished	
5.6.2.2	The WCSRI shall provide a capability to support a spatial interpolation method of "nearest neighbor"	Start	Finished	
5.6.2.3	The WCSRI shall provide Units of Measure for each field within a coverage as part of the `CoverageSummary` results	Start	Finished	
5.7.1	For the GetCoverage operation, the WCSRI shall support SOAP encoding over HTTP POST	Finished		
5.8.1	The WCSRI shall provide a mechanism (and potentially configuration capability) for notifying the Service Provider of storage problems (e.g., out of space) encountered when trying to write temporary data files			Finished
5.9.1	The WCSRI shall support a `GetMetadata` operation. The level of metadata requested (e.g., dataset, field), as well as the particular metadata content, shall be specified in the operation request		Finished	

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
6.1	The WCSRI installation shall include, at a minimum, a description of the procedure for adding and removing offered coverages, and updating the metadata for those coverages	Start		Finished
6.1.1	The WCSRI shall provide a low-latency means to distribute filtered data (such as geometric and temporal subsets) to interested data consumers. The mechanism used to distribute filtered data shall be consistent with what is used by other 4-D Wx Data Cube fundamental components, such as the WFSRI		Finished	
6.2.1	The WCSRI shall be capable of acting as a data consumer of WCSRI services		Start	Finished
6.2.2	The WCSRI shall be capable of acting as a backup instance for another physical node for failover purposes (e.g., NWS as primary source, FAA as backup source)		Start	Finished
6.2.3	The WCSRI shall be capable of acting as a backup instance within an NNEW node for failover purposes i.e., two pieces of hardware in the same 4-D WX Data Cube node, such as how Experimental ADDS has multiple hosts that are used for failover)		Start	Finished
6.2.4	The WCSRI shall be capable of acting as a participant in a load balancing group for a dataset within a node. (i.e., two pieces of hardware in the same 4-D WX Data Cube node, such as how Experimental ADDS has multiple hosts that are used for load balancing)		Start	Finished
6.2.5	The WCSRI shall be capable of acting as a proxy or request delegate to another upstream WCSRI		Finished	
6.2.6	The WCSRI shall be capable of acting as a consumer of one or more upstream WCSRIs using their data push mechanism to cache data locally		Finished	
6.2.7	The WCSRI shall provide the capability to configure a variety of architectural patterns on a product-by-product basis (i.e., different coverages may warrant different WCSRI communication patterns)		Finished	
6.5.1	The WCSRI shall provide remotely accessible monitoring information relating to WCSRI status, transaction statistics, errors, configured elements, data product latency, performance characteristics, and other WCSRI-specific information. This capability shall be configurable to allow for different levels of monitoring detail and will leverage the SWIM monitoring infrastructure		Start	Finished
6.5.2	The WCSRI shall be capable of notifying Service Providers or system		Start	Finished

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
	maintainers of critical errors in realtime or near-realtime. This may be through email, notifications, or other means			
6.6.1	The WCSRI shall provide auditing capabilities that allows an authorized client to gather historical (i.e., 15 days minimum) information regarding system usage and health. This information will include request/response details		Start	Finished
6.6.2	The WCSRI shall provide the capability to "duplicate" a request and its precise response (including the data), for a rolling configurable time period		Start	Finished
6.7.1	The WCSRI shall provide the capability to configure the level of logging and specifics as to what is logged	Start		Finished
6.7.2	The WCSRI shall record information sufficient to support audit reporting		Start	Finished
6.8.1	WCSRI shall perform stringent data validation for communications, including but not limited to requests for data and messages/notifications sent from upstream nodes	Start		Finished
6.8.2	The WCSRI shall be compliant with the 4-D Wx Data Cube security policies and implementation(s)	Start		Finished
6.8.3	The WCSRI shall provide configurable, role-based access to WCSRI web-service endpoints. Implementation of this requirement will leverage SWIM infrastructure security solutions	Start		Finished
6.8.4	The WCSRI shall provide configurable, role-based access to WCSRI-offered coverages and their data fields. Implementation of this requirement will leverage SWIM infrastructure security solutions	Start		Finished
6.8.5	The WCSRI shall provide security credentials (i.e., a user, group, or role) to interact with upstream and/or downstream WCSRI data providers and consumers		Start	Finished
7.1	The WCSRI shall implement infrastructure capabilities in a manner compliant with the SWIM service container, and shall leverage SWIM mechanisms wherever appropriate	Start		Finished
7.2	The WCSRI shall include WSDL definitions of the web services that it provides	Start		Finished
7.3	The WCSRI shall support the deployment and installation of the WCS operations (e.g., GetCapabilities, DescribeCoverage, GetCoverage) into the SWIM service container, either through installation scripts or documentation for Service Providers	Start		Finished

WCS#	WCS Requirement Text	V1.0	V2.0	V3.0
8.1	The WCSRI shall not be tightly coupled to a particular service container. At a minimum, the WCSRI shall be deployable within Apache Tomcat as well as the SWIM service container		Start	Finished
8.2	The WCSRI shall run on Linux and Windows	Finished		
9.1	The WCSRI shall provide a means to add new data formats for native data storage	Finished		
9.2	The WCSRI shall provide a means to add new data formats at the interface level	Finished		
9.3	The WCSRI shall allow for two versions of the WCSRI to be run concurrently in the same environment on the same node	Finished		
9.4	The WCSRI shall allow for additional protocols to be implemented and deployed alongside the WCS protocol	Finished		
10.1	The WCSRI shall be capable of running a self-test diagnostic following installation. Canned datasets and default configurations will be provided with the software release for that purpose	Start		Finished
10.2	The WCSRI shall include or allow the use of WS-I compliance-checking tools		Start	Finished

Appendix D: System Level Requirements

Listed below are DRAFT system level requirements for the 4-D Wx Data Cube. These requirements are based on a 4-D Wx Data Cube System Specification that is under development and are subject to change.

Table 5: System Level Requirements

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.2.1.1	Data and Service Discovery	The System shall support design-time discovery of services	X			Available
3.2.1.2	Data and Service Discovery	The System shall support design-time discovery of weather data.	X			Available
3.2.1.3	Data and Service Discovery	The System shall support run-time discovery of services.	X			Available
3.2.1.4	Data and Service Discovery	The System shall support run-time discovery of weather data.	X			Available
3.2.1.5	Data and Service Discovery	The System shall support semantically enhanced discovery of weather data.	X			Available
3.2.1.6	Data and Service Discovery	The System shall allow providers to supply descriptions of weather data.	X			Available
3.2.1.7	Data and Service Discovery	The System shall allow users to access descriptions of weather data.	X			Available
3.2.1.8	Data and Service Discovery	The System shall allow providers to supply descriptions about weather services.	X			Available
3.2.1.9	Data and Service Discovery	The System shall allow users to access descriptions about weather services	X			Available

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.2.2.1	Data Access Services	The System shall provide a publication/subscription message exchange pattern to consumer systems.	X			Available
3.2.2.2	Data Access Services	The System shall provide a notification message exchange pattern.		X		
3.2.2.3	Data Access Services	The System shall provide a request/response message exchange pattern.	X			Available
3.2.2.4.1	Data Access Services	The System shall ingest gridded weather data from legacy data providers.	X			Available
3.2.2.4.2	Data Access Services	The System shall disseminate unfiltered gridded weather data.	X			Should be available
3.2.2.4.3	Data Access Services	The System shall disseminate filtered gridded weather data using temporal constraints.	X			Should be available
3.2.2.4.4	Data Access Services	The System shall disseminate filtered gridded weather data by parameter range.	X			Should be available
3.2.2.4.5	Data Access Services	The System shall disseminate filtered gridded weather data using geospatial constraints, including the following: • 3-D Bounded Box • 2-D Region • Point • Horizontal Cross-Section • Vertical Cross-Section • Trajectory • Corridor		X		Some will be in the demo and others will not (unknown which are not finished)

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
		• Airway • Sector • Sounding				
3.2.2.4.5	Data Access Services	The System shall disseminate gridded weather data in the following geographic projections: • Lambert Conformal Conic • Latitude/Longitude • Mercator • Stereographic (including polar) • Polar Radar • NAS Projection		X		Some will be in the demo and others will not (unknown which are not finished)
3.2.2.4.7	Data Access Services	The system shall be capable of disseminating gridded weather data with respect to the following references: 1. Airport ID 2. Air Route Traffic Control Center (ARTCC) ID 3. Terminal Radar Approach Control (TRACON) ID 4. Continental United States (CONUS) 5. Airway ID 6. Navaid or named intersection ID		X		Not sure if this functionality is available by the CapEval. The WCS/WFS RIs do not have a requirement that covers resolving these references.
3.2.2.4.8	Data Access Services	The System shall provide the capability of converting gridded weather data to lower resolutions.		X		Some functionality may be there but the full functionality will not be available until v3.
3.2.2.5	Data Access Services	The System shall ingest non-gridded weather data from legacy data providers.	X			Available

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.2.2.5.2	Data Access Services	The System shall disseminate unfiltered, non-gridded weather data.	X			Available
3.2.2.5.3	Data Access Services	The System shall disseminate filtered, non-gridded weather data using temporal constraints.	X			Available
3.2.2.5.4	Data Access Services	The system shall be capable of disseminating non-gridded weather data with respect to the following references: • Airport ID • ARTCC ID • TRACON ID • CONUS • Airway ID • NAVAID or named intersection ID		X		Not sure if this functionality is available by the CapEval. The WCS/WFS RIs do not have a requirement that covers resolving these references.
3.2.2.5.5	Data Access Services	The System shall disseminate filtered, non-gridded weather data using geospatial constraints, including the following: • 3-D Bounded Box • 2-D Region • Point • Horizontal Cross-Section • Vertical Cross-Section • Trajectory • Corridor • Airway • Sector • Sounding		X		Some will be in the demo and others will not (trajectory and corridor)
3.2.2.6	Data Access Services	The System shall disseminate weather data in geo-referenced map image file formats.			X	Yet to be resolved

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.2.2.7	Data Access Services	The System shall disseminate legacy, binary-file formats.			X	Yet to be resolved
3.2.2.8	Data Access Services	The System shall support transformations among the following measures of altitude: • Flight Level • Meters above mean sea level (MSL) • Feet above ground level (AGL) • Feet above MSL • Standard Pressure		X		Some functionality may be there but the full functionality will not be available until v3.
3.2.2.9	Data Access Services	The System shall support conversions between true north and magnetic north.		X		Currently no found reference to such a requirement in either WCS/WFS RI documents
3.2.2.10	Data Access Services	The System shall support the following conversions between English and metric measurements.		X		Currently no found reference to such a requirement in either WCS/WFS RI documents
3.2.3.1	Cube Utility and Composed Services	The System shall support requests for complex retrieval processing.			X	This functionality has not been fully defined, yet.

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.3.1.1	Performance	The System shall support disseminating publications of weather information based on products in the IOC Product List with update rates greater than 1 hour with a maximum one-way response time of 120 (TBR) seconds (objective) and 420 (TBR) seconds (threshold), assuming a 90% (TBR) sub-setting factor.			X	Not a requirement for the CapEval, but performance will be measured.
3.3.1.2	Performance	The System shall support disseminating publications of weather information based on products in the IOC Product List having update rates less than 1 hour and greater than 15 minutes with a maximum one-way response time of 60 (TBR) seconds (objective) and 120 (TBR) seconds (threshold), assuming a 90% (TBR) sub-setting factor.			X	Not a requirement for the CapEval, but performance will be measured.
3.3.1.3	Performance	The System shall support disseminating publications of weather information based on products in the IOC Product List having update rates of less than 15 minutes and greater than or equal to 5 minutes with a maximum one-way response time of 30 (TBR) seconds (objective) and 60 (TBR) seconds (threshold), assuming a 90% (TBR) sub-setting factor.			X	Not a requirement for the CapEval, but performance will be measured.
3.3.1.4	Performance	The System shall support disseminating weather information based on products in the IOC Product List having update rates less than 5 minutes and greater than or equal to 1 minute with a maximum one-way response time of 5 (TBR) seconds (objective) and 30 (TBR) seconds (threshold), assuming a 90% (TBR) sub-setting factor.			X	Not a requirement for the CapEval, but performance will be measured.
3.3.1.5	Performance	The System shall support guaranteed message delivery.		X		Some functionality exists, but not fully

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
						functional until v3.
3.3.1.6	Performance	The System shall provide critical services with an availability of TBD.			X	Availability will not measured during the demo
3.3.1.7	Performance	The System shall provide essential services with an availability of TBD.			X	Availability will not measured during the demo
3.3.1.8	Performance	The System shall provide a mean time between failures for critical services of TBD.			X	Availability will not measured during the demo
3.3.1.9	Performance	The System shall provide a mean time between failures for essential services of TBD.			X	Availability will not measured during the demo
3.3.1.10	Performance	The System shall provide a mean time to recover for critical services of TBD.			X	Availability will not measured during the demo
3.3.1.11	Performance	The System shall have a maximum outage period of less than or equal to TBD.			X	Availability will not measured during the demo
3.3.1.12	Performance	The System shall support the capability of categorizing weather data into domains.		X		This is probably a registry requirement

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
						and since those requirements haven't been written it's hard to tell about this one.
3.3.1.13	Performance	The System shall be agile such that future product enhancements and updates will not interrupt System operations.		X		Not specifically identified in the WCS/WFS RI documents.
3.3.1.14	Performance	The System shall support the capability of making new services available.	X			Should be available
3.3.1.15	Performance	The System shall support the capability of making new data available.	X			Should be available
3.3.1.16	Performance	The System shall support the capability of modifying existing services while not interrupting other operations of the Cube.	X			Should be available
3.3.1.17	Performance	The System shall support the capability of modifying existing metadata.	X			Should be available
3.3.1.18	Performance	The System shall support the capability of removing existing services while not impacting operational providers and consumers.	X			Should be available
3.3.1.19	Performance	The System shall support the capability of removing existing metadata while not impacting operational providers and consumers.	X			Should be available
3.3.1.20	Performance	The System shall support the ability to notify users of changes to the System consistent with 3.3.1.14 through 3.3.1.19.		X		This is probably a registry requirement and since those

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
						requirements haven't been written it's hard to tell about this one.
3.3.1.21	Performance	The System shall provide for fault management of services by: • Detecting errors • Tracing and identifying failures • Performing diagnostic tests		X		The WCS/WFS RIs requirements cover a) and b) but not c). 6.5.1 and 6.5.2.
3.3.1.22	Performance	The System shall disseminate data based on precedence and prioritization.			X	QoS strategy has not been implemented yet.
3.3.2.1	Data Archiving	The System shall be capable of archiving weather data for 15 days, in the event that a provider system does not archive its data for the requisite 15 days.	X			Requirement 4.1.5 in both WCS/WFS RI requirements docs.
3.3.2.2	Data Archiving	The System shall archive queries for weather data for 15 days (TBR).		X		These capabilities are covered in 6.6.x of the WCS/WFS RI requirements. The WCS won't fully implement until v3 but the WFS has it being done in v2.

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.3.2.3.	Data Archiving	The System shall archive the response, excluding the data itself, to queries for weather data for 15 days.		X		
3.3.2.4	Data Archiving	The System shall have the capability of retrieving Cube-archived weather data.		X		
3.3.3.1	Security	The System shall identify information system users, processes acting on behalf of users, and devices.		X		Security will not be fully available until v3. Some security may be available during the CapEval, but it will not be a requirement of the CapEval.
3.3.3.2	Security	The System shall authenticate the identities of users, processes, and devices as a prerequisite to allowing access to system resources.		X		
3.3.3.3	Security	The System shall limit access to System resources to authorized users, processes acting on behalf of users and devices (including other information systems).		X		
3.3.3.4	Security	The System shall limit access to System resources to the types of transactions and functions that authorized users are permitted to exercise.		X		
3.3.3.5	Security	The System shall monitor, control, and protect information exchanged at the external boundaries and key internal boundaries of the System.		X		
3.3.3.5.1	Security	The System shall provide for the integrity of messages exchanged between providers and consumers.		X		

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.3.3.5.2	Security	The System shall provide for the confidentiality of messages exchanged between providers and consumers.		X		
3.3.3.6	Security	The System shall create, protect, and retain audit records to enable the monitoring, analysis, investigation, and reporting of unlawful, unauthorized, or inappropriate system activity.		X		
3.3.3.6.1	Security	The System shall have the capability of retrieving archived queries that were used to obtain weather data.		X		
3.3.3.6.2	Security	The System shall have the capability of retrieving archived responses to queries for weather data.		X		
3.3.3.7	Security	The System shall ensure that the actions of individual system users can be uniquely traced to those users.		X		
3.3.3.8	Security	The System shall provide for the administration of security policies.		X		
3.3.3.9	Security	The System shall protect against threats to availability of services. (TBR)			X	Still not resolved
3.3.3.10	Security	The System shall provide for the availability of services across agency boundaries. (TBR)			X	Still not resolved
3.3.4.1	Service Monitoring	The System shall provide for federated information management.	X			Available
	Service Monitoring	The System shall provide a centralized help desk with the following: (TBD)			X	To be determined… will not be available.
3.3.4.3	Service Monitoring	The System shall provide access to all System logs.			X	

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
3.3.4.4	Service Monitoring	The System shall log the event type, the specific event, the time of the event, and any alerts generated as a result of the event for each of the following event types: 1) Additions 2) Updates 3) Removals		X		These requirements are not specifically spelled out in the WCS/WFS RI requirements, but general logging should be available as a part of the CapEval.
3.3.4.5	Service Monitoring	The System shall log any request for information, what was requested, the requestor making the request, the time of the request, if the request was fulfilled, the time that the request was fulfilled, and the responder that fulfilled the request for the following dissemination types: 1) Requests 2) Responses		X		
3.3.4.7	Service Monitoring	The System shall log all errors, including the component that had the error, the type of error that it incurred, the level of error (critical, non-critical, etc), the time that the error occurred, any alerts that were generated as a result of the error, and any action that were taken to isolate or correct the error.		X		
3.3.4.7	Service Monitoring	The System shall have the capability of generating reports.		X		Should be available for the WFS RI. Not fully available until v3

Number	Requirement Category	Requirement	Will be tested	May be tested; not required	Not available for testing	Comments
						for the WCS RI
3.4.2.1	Communications	The System shall utilize the standards and specifications referenced in Appendix D for data exchange.	X			The System is based on open standards.
3.4.2.2	Communications	The System shall support mediation services for interoperability for different data models.			X	This may be outside the scope of the WCS/WFS RIs. Recommend this not be a part of the this year's CapEval

Appendix E: NEVS Capability Evaluation Requirements

Table 6: NEVS Capability Evaluation Requirements

NEVS#	NEVS Requirement Text	FY10 Demo	FY11 Demo	FY12 Demo
1.1	The NEVS shall provide the capability to request, ingest, and process net-enabled data as a consumer of 4-D Weather Data Cube services.	✘		
1.2	The NEVS shall provide the capability to provide quality assessment verification data via a web page graphical display.	✘		
1.3	The NEVS shall provide the capability to subscribe to net-enabled data required for verification of products and data.		✘	
1.4	The NEVS shall provide the capability to publish verification data via a web mapping service.		✘	
1.5	The NEVS shall provide the capability to publish verification data via a web feature service.		✘	
1.6	The NEVS shall provide the capability to publish verification data via a web coverage service.		✘	
1.7	The NEVS shall provide the capability to publish verification data via a web summary service (i.e., a service that allows the publication of non-gridded, non-object data. This service needs to be developed)			✘

Appendix F: Data Flow

The table below lists the products that are candidates for inclusion in the FY10 4-D Wx Data Cube Capability Evaluation. 'Update Frequency' refers to product generation time (not how often a product is sent to an endpoint via the Cube). Products listed under the NSSL Product Group are categorized by Primary and Secondary. Primary refers to products that will most likely be demonstrated in the FY10 Capability Evaluation, and Secondary refers to products that are available for retrieval, but may not be requested for in the demo.

Table 7: FY10 Capability Evaluation Data Flow

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
NEXRAD Level III Products							
	Product 2	Yes	GSD (Boulder)	NWP (WJHTC)	4-10 minutes		
	Product 3	Yes	GSD (Boulder)	NWP (WJHTC)	4-10 minutes		
	Product 20	Yes	GSD (Boulder)	NWP (WJHTC)	7.31 minutes	8,166	29,130
	Product 38	Yes	GSD (Boulder)	NWP (WJHTC)	7.32 minutes	4,596	16,508
	Product 41	Yes	GSD (Boulder)	NWP (WJHTC)	4-10 minutes	190	4,208
	Product 57	Yes	GSD (Boulder)	NWP (WJHTC)	7.32 minutes	1,348	3,250
	Product 59	Yes	GSD (Boulder)	NWP (WJHTC)	5.90 minutes	1,596	12,022
	Product 66	Yes	GSD (Boulder)	NWP (WJHTC)	7.33 minutes	1,348	4,180
	Product 75	Yes	GSD (Boulder)	NWP (WJHTC)	4-10 minutes		
	Product 90	Yes	GSD (Boulder)	NWP (WJHTC)	7.34 minutes	1,348	2,602

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Product 93	Yes	GSD (Boulder)	NWP (WJHTC)	4-10 minutes		
	Product 134	Yes	GSD (Boulder)	NWP (WJHTC)	7.32 minutes	168,000	168,000
	Product 135	Yes	GSD (Boulder)	NWP (WJHTC)	4-10 minutes	127,000	127,000
	Product 141	Yes	GSD (Boulder)	NWP (WJHTC)	5.99 minutes	150	3,364
	Product 143	Yes	GSD (Boulder)	NWP (WJHTC)	5.97 minutes	2,142	5,112
GOES E Imagery Data							
	Visible (1 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	198,400,000	297,600,000
	Infrared Channel 1 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 2 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 3 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 4 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 6 (8 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Water Vapor (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
GOES W Imagery Data							
	Visible (1 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	198,400,000	297,600,000

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Infrared Channel 1 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 2 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 3 (8 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 4 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Infrared Channel 5 (4 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
	Water Vapor (8 km)	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	15 minutes	49,600,000	74,400,000
WRF-RR Model Data							
	WRF-RR winds	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	Hourly	50,000	120,000
	WRF-RR Temps	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	Hourly	50,000	120,000
HRRR Model Data							
	15-Minute VIL	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	Hourly	30,000	150,000
	15-Minute Echo Tops	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	Hourly	30,000	150,000

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Pressure	Yes	GSD (Boulder)	NWP & NAS Simulator (WJHTC)	Hourly	30,000	150,000
RASP Surface Observations							
	One Minute Observations	Yes	RASP	NWP & MADIS (Possible locations are NCEP, Gaithersburg, MD, Silver Spring MD, or Boulder CO.)	60 seconds	230 per Ob	
MADIS Surface Observations							
	METARs (NOAA generated)	Yes	MADIS via GSD	NAS Simulator (WJHTC)	5-6 mins	671,298	1,358,632
	Mesonet	Potential	MADIS via GSD	NAS Simulator (WJHTC)	5-6 mins	718,898	13,214,618
	Maritime	Potential	MADIS via GSD	NAS Simulator (WJHTC)	5-6 mins	10,677	247,271
Lightning Data							
	Lightning Detection Data (FAA Contractor)	Yes	RASP	NWP & Simulator (WJHTC)			
	Sensor Up/Down Messages		RASP	NWP & Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
Observation and Warning Data							
	METARs (FAA generated)	Yes	RASP, NCAR	NAS Simulator (WJHTC)	Hourly or less		
	SPECIs	Yes	RASP	NAS Simulator (WJHTC)	Hourly or less		
Convective Wx Products (0-2 hours)							
	VIL Mosaic (Current/Minute 0)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	150 seconds	537,296	2,466,687
	VIL Mosaic Data Quality Flags (Current/Minute 0)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	VIL Phase Forecast (Minute 0)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	VIL (Current/Minute 0), quantized	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	VIL Forecast (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	1,849,364	31,041,632
	VIL Phase Forecast (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	VIL Mosaic Data Quality Flags (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	VIL Forecast (0-2 hours), quantized	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	Echo Tops Mosaic (Current/Minute 0)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	150 seconds	221,281	733,984
	Echo Tops Mosaic Data Quality Flags (Current/Minute 0)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Echo Tops (Current/Minute 0), quantized	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	Echo Tops Forecast (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	558,185	7,676,298
	Echo Tops Forecast (0-2 hours), quantized	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	GOES Satellite Mosaic (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	900 seconds	2,502,555	6,546,790
	Storm Info : Echo Top Tags (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	150 seconds	571	6,399
	Storm Info : Leading Edges (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	150 seconds	671	37,519
	Storm Info : Motion Vectors (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	150 seconds	568	3,562
	VIL Contours (Standard Mode) (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	620	69,309
	VIL Contours (Winter Mode) (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	2,290	458,569
	Echo Tops Contours (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	625	51,246
	Growth Contours (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	150 seconds	574	28,853
	Decay Contours (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)			
	Forecast Accuracy : Echo Tops (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	2,209	2,306
	Forecast Accuracy : Standard Precip (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	2,219	2,422

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Forecast Accuracy : Winter Precip (0-2 hours)	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	300 seconds	2,209	2,563
	Lightning	Yes	MIT/LL (Boston)	NAS Simulator (WJHTC)	60 seconds	573	13,181
NSSL Products Primary (1) Secondary (2)							
(1)	Lightning Density	Yes	NSSL	NAS Simulator (WJHTC)	1 minute	10,000	5,000,000
(1)	Lightning Probability 0-30min	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	5,000,000
(1)	Brightband Top Radar/RUC derived	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	1,000,000	2,000,000
(1)	Brightband Bottom Radar/RUC derived	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	1,000,000	2,000,000
(1)	Radar Quality Index	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	1,000,000	2,000,000
(1)	Radar Coverage	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(1)	Radar VCP	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(1)	Echo Top 18dBZ Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	1,000,000
(1)	VIL based 3D Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	200,000
(1)	500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	750m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	1000m Flight Level	Yes	NSSL	NAS Simulator	5 minutes	100,000	5,000,000

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Reflectivity Mosaic			(WJHTC)			
(1)	1250m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	1500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	1750m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	2000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	2250m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	2500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	2750m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	3000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	3500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	4000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	4500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	5000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	5500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	6000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	6500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	7000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
(1)	7500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	8000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	8500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	9000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	9500m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	10000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	11000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	12000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	13000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	14000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	15000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	16000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(1)	18000m Flight Level Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(2)	30-min Forecast Composite Reflectivity Mosaic 0-60k ft	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	30-min Forecast VIL	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	200,000
(2)	Azimuth Shear 0-3km AGL	Yes	NSSL	NAS Simulator (WJHTC)	2 minutes	500,000	10,000,000

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
(2)	Azimuth Shear 3-6km AGL	Yes	NSSL	NAS Simulator (WJHTC)	2 minutes	500,000	10,000,000
(2)	Azimuth Shear 0-3km AGL 30-minute Max	Yes	NSSL	NAS Simulator (WJHTC)	2 minutes	500,000	10,000,000
(2)	Azimuth Shear 3-6km AGL 30-minute Max	Yes	NSSL	NAS Simulator (WJHTC)	2 minutes	500,000	10,000,000
(2)	Severe Hail Index	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500	10,000
(2)	Prop of Severe Hail	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	200	10,000
(2)	MESH 30-min Max Swath (HailSwath)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	100,000
(2)	Maximum Expected Size of Hail (MESH)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	1,000	20,000
(2)	Surface Precipitation Phase (Frozen/Liquid)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	2,000,000
(2)	Surface Precipitation Type (Convective/Stratiform/ Tropical/Snow)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	2,000,000
(2)	Precipitation Rate	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	2,000,000
(2)	Precipitation 1-hour Accumulation	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	Precipitation 3-hour Accumulation	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	1,000,000	15,000,000
(2)	Freezing Height Radar	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	Mosaic Base Reflectivity (optimal method)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	Composite Reflectivity Mosaic 0-60k ft. (optimal method)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
(2)	Height of Composite Reflectivity Mosaic 0-60k ft. (optimal method)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	UnQc'd Composite Reflectivity Mosaic 0-60k ft. (max ref)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	Composite Reflectivity Mosaic 0-60k ft. (max ref)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	5,000,000
(2)	VIL Density based on 3D Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	10,000	200,000
(2)	Storm Top 30dBZ Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	1,000,000
(2)	Low Layer Reflectivity Mosaic 0-24kft (low altitude)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(2)	Layer Composite Reflectivity Mosaic 24-60 kft (highest altitude)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(2)	Layer Composite Reflectivity Mosaic 33-60 kft (super high altitude)	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(2)	Hybrid Scan Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(2)	VPR 'corrected' Hybrid Scan Reflectivity Mosaic	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	100,000	5,000,000
(2)	Height of Hybrid Scan Reflectivity	Yes	NSSL	NAS Simulator (WJHTC)	5 minutes	500,000	15,000,000
ADDS Products							

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Convective SIGMET	Yes	NCEP (AWC/ADDS)	NAS Simulator (WJHTC)	Hourly	150	3812
	Non-convective SIGMET	Yes	NCEP (AWC/ADDS)	NAS Simulator (WJHTC)	Event Driven	80	500
	Volcanic ash SIGMET	Yes	NCEP (AWC/ADDS)	NAS Simulator (WJHTC)	Event Driven	80	800
	PIREPs	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	Event Driven	100	220
	GTG	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	Hourly	2,776,153	3,436,105
	GTG Composite	Yes	NCEP (AWC/ADDS)	NAS Simulator (WJHTC)	Hourly	86,772	86,772
	CIP-20	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	Hourly	3,210,442	4,054,248
	CIP-40	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	Hourly	534,836	686,532
	FIP	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	Hourly	1,814,751	2,689,474
	NCWD	Yes	NCEP (AWC/ADDS)	NAS Simulator (WJHTC)	5 minutes	210,000	400,000
	NCWF	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	5 minutes	165	10,000
	TAFs	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	6 hours	100	800
	AIRMETs	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	6 hours	300	2,200
	G-AIRMET	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	6 hours	500	35,000
	CCFP	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)	10x per 24 hours	132	10,000
	GFS (WAFS grids)	Yes	NCEP (AWC/ADDS), NCAR	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
NOMADS Products (Used CONUS RUC 13km grid #130 as basis)							
	RUC - temps	Yes	NOMADS, NCAR	NAS Simulator (WJHTC)	Hourly	30,000	60,000
	RUC – winds (u)	Yes	NOMADS, NCAR	NAS Simulator (WJHTC)	Hourly	30,000	60,000
	RUC – winds (v)	Yes	NOMADS, NCAR	NAS Simulator (WJHTC)	Hourly	30,000	60,000
	RUC – winds (o)	Yes	NOMADS, NCAR	NAS Simulator (WJHTC)	Hourly	30,000	60,000
NDFD Grids							
Basis Surface Weather Elements	12-hour Probability of Precipitation (PoP12)	Yes	MDL	NAS Simulator (WJHTC)			
	Dew Point (Td)	Yes	MDL	NAS Simulator (WJHTC)			
	Maximum Temperature (MaxT)	Yes	MDL	NAS Simulator (WJHTC)			
	Minimum Temperature (MinT)	Yes	MDL	NAS Simulator (WJHTC)			
	Quantitative Precipitation Amount (QPF06)	Yes	MDL	NAS Simulator (WJHTC)			
	Sky Cover (Sky)	Yes	MDL	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Snow Amount (Snow)	Yes	MDL	NAS Simulator (WJHTC)			
	Temperature (T)	Yes	MDL	NAS Simulator (WJHTC)			
	Wind Direction (WDir)	Yes	MDL	NAS Simulator (WJHTC)			
	Wind Gust (WGust)	Yes	MDL	NAS Simulator (WJHTC)			
	Wind Speed (WSpd)	Yes	MDL	NAS Simulator (WJHTC)			
Convective Outlook Hazard Probabilities	Convective Hazard Outlook (ConHazO)	Yes	MDL	NAS Simulator (WJHTC)			
	Probability of Tornadoes (PTornado)	Yes	MDL	NAS Simulator (WJHTC)			
	Probability of Hail (PHail)	Yes	MDL	NAS Simulator (WJHTC)			
	Probability of Damaging Thunderstorm Winds (PTstmWinds)	Yes	MDL	NAS Simulator (WJHTC)			
	Probability of Extreme Tornadoes (PXTornado)	Yes	MDL	NAS Simulator (WJHTC)			
	Probability of Extreme Hail (PXHail)	Yes	MDL	NAS Simulator (WJHTC)			
	Probability of Extreme Thunderstorm Winds (PXTstmWinds)	Yes	MDL	NAS Simulator (WJHTC)			
	Total Probability of Severe Thunderstorms (PTotSvrTstm)	Yes	MDL	NAS Simulator (WJHTC)			
	Total Probability of Extreme Severe	Yes	MDL	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Thunderstorms (PTotXSvrstm)						
LAMP Experimental Guidance TAFs							
	Categorical Thunderstorm	Yes	MDL	NAS Simulator (WJHTC)			
	Dew Point	Yes	MDL	NAS Simulator (WJHTC)			
	Temperature	Yes	MDL	NAS Simulator (WJHTC)			
	Thunderstorm Probability	Yes	MDL	NAS Simulator (WJHTC)			
AutoNowcaster (ANC) Products							
	3-DWindFiled-Analysis-Ajoint-MLB	Yes	MDL	NAS Simulator (WJHTC)			
	60MinTstromFcst-Autonowcaster-MLB	Yes	MDL	NAS Simulator (WJHTC)			
	60MinTstormInitLikelihood-Autonowcaster-MLB	Yes	MDL	NAS Simulator (WJHTC)			
	TstormFcstVerifcation-Autonowcaster-MLB	Yes	MDL	NAS Simulator (WJHTC)			
	3-DWindFiled-Analysis-Adjoint-FWD	Yes	MDL	NAS Simulator (WJHTC)			
	60MinTstormFcst-Autonowcaster-FWD	Yes	MDL	NAS Simulator (WJHTC)			
	60MinTstormInitLikelihood-Autonowcaster-FWD	Yes	MDL	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	TstormVerification-Autonowcaster-FWD	Yes	MDL	NAS Simulator (WJHTC)			
Other Potential Products for FY10 Demo							
	NEVS Data	Potential					
	AIM Airport GIS Information	Yes					
	EUROCONTROL Data	Potential					
IOOS Products							
	Air Temperature	Potential	CO-OPS	TBD			
	Water Level	Potential	CO-OPS	TBD			
	Barometric Pressure	Potential	CO-OPS	TBD			
	Winds	Potential	NDBC, CO-OPS	TBD			
	Waves	Potential	NDBC	TBD			
Reflectivity Mosaics							
	Mosaic Base Reflectivity (2km resolution with maximum reflectivity method)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Mosaic Base Reflectivity (4km resolution with maximum reflectivity method)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Mosaic Base Reflectivity (2km resolution with optimal mosaic method)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Mosaic Base Reflectivity (4km resolution with optimal mosaic method)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Composite Reflectivity Mosaic 0-60k ft. (4km resolution with maximum reflectivity method)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Composite Reflectivity Mosaic 0-60k ft. (4km resolution with optimal mosaic method)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Digital VIL Mosaic (2km resolution)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Digital VIL Mosaic (4km resolution)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Enhanced Echo Top Mosaic (2km resolution)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Enhanced Echo Top Mosaic (4km resolution)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Echo Top Mosaic	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Low Layer Reflectivity Mosaic 0-24kft (low altitude)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			

Product Group	Product	FY10 Candidate?	FY10 Source System or Publisher	FY10 Demo User/Consumer	Update Frequency	Minimum Size (bytes)	Maximum Size (bytes)
	Layer Composite Reflectivity Mosaic 24-60 kft (highest altitude)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
	Layer Composite Reflectivity Mosaic 33-60 kft (super high altitude)	Potential	NWP (WJHTC)	NAS Simulator (WJHTC)			
Objective Products with Formats not included above							
NIDS							
	Products from NIDS list	Potential	NCEP(AWC)	NAS Simulator (WJHTC)			

Appendix G: Capability Evaluation Requirements for Supported Datasets/Products

Due to testing time constraints and the scope of the available datasets/products, each of the requirements below may not end up being verified for each and every dataset/product supported in the Capability Evaluation. However, every attempt should be made to ensure that as many datasets/products are tested as possible. These requirements are derived from the 4-D Weather (Wx) Data Cube System Specification.

Table 8: Capability Evaluation Requirements for Supported Datasets/Products

Related System Specification Requirement Identifier	Dataset/Product Requirement Description
3.2.2.4.1 (gridded) or 3.2.2.5.1 (non-gridded)	Shall demonstrate the ingest of weather data from data provider
3.2.1.8	Shall demonstrate the publishing of metadata about the service providing access to the dataset/product
3.2.1.2	Shall demonstrate the publishing of metadata about the dataset/product
3.2.1.6	Shall demonstrate the discovery of metadata about service providing access to dataset/product
3.2.1.7	Shall demonstrate the discovery of metadata about dataset/product
3.2.2.3 & 3.2.2.4.2 (gridded) or 3.2.2.5.2 (non-gridded)	Shall demonstrate, via an adhoc request/response interchange, access to and retrieval and verification of the accuracy of an unfiltered dataset/product from its respective service.
3.2.2.1 & 3.2.2.4.2 (gridded) or 3.2.2.5.2 (non-gridded)	Shall demonstrate, via a subscription-based interchange, access to and retrieval and verification of the accuracy of an unfiltered dataset/product from its respective service.
3.2.2.3 & 3.2.2.4.3 (gridded) or 3.2.2.5.3 (non-gridded)	Shall demonstrate, via an adhoc request/response interchange, access to and retrieval and verification of the accuracy of a temporally filtered dataset/product from its respective service.
3.2.2.1 & 3.2.2.4.3 (gridded) or 3.2.2.5.3 (non-gridded)	Shall demonstrate, via a subscription-based interchange, access to and retrieval and verification of the accuracy of a temporally filtered dataset/product from its respective service.
3.2.2.3 & 3.2.2.4.5 (gridded) or 3.2.2.5.5 (non-gridded)	Shall demonstrate, via an adhoc request/response interchange, access to and retrieval and verification of the accuracy of a geospatially filtered dataset/product from its respective service.
3.2.2.1 & 3.2.2.4.5 (gridded) or 3.2.2.5.5 (non-gridded)	Shall demonstrate, via a subscription-based interchange, access to and retrieval and verification of the accuracy of a geospatially filtered dataset/product from its respective service.

Appendix H: Content and Format of the Capability Evaluation (CE) and Performance Acceptance Test (PAT) Procedures

** This is template C-6 from the ***Test and Evaluation Process Guidelines (archived version 4/2010)*** document. Development Test has been replaced with Capability Evaluation.

Note: The CE/PAT Test Procedure format is tailored to the type of test, and/or phase of testing required by contract (production acceptance, site acceptance, factory acceptance, software, system, etc.).

Title Page: The title page contains the name of the program and the words "Test Procedure for _____ *(enter the specific test name and test identifier)*." The title page contains the signature of the program manager, the test manager, and the quality assurance manager. The title page must be signed prior to submission for review.

Table of Contents: The table of contents contains each test and/or subtest and its test identifier with associated paragraph titles and page numbers. Illustrations, tables, and figures are listed separately.

1.0 Introduction: This section is divided into the following paragraphs.

1.1 Purpose: This paragraph includes the following statement in its entirety: "The purpose of this test procedure is to validate the requirements of _____ *(enter contract system specification number)* assigned to this test procedure, for the _____ *(enter official system title and contract number)*. This test procedures documents _____ *(enter contractor's company name)* test strategy in order to verify the requirements of the contract."

1.2 Scope: This paragraph provides an overview/brief description of the test to be accomplished. This paragraph describes in general terms the type of test to be accomplished by this procedure and how the test relates to the overall test program.

2.0 Reference Documents: This section contains all requirements documents used in the development of the test procedure.

3.0 Test Description: This section will be divided into the following paragraphs.

3.1 System Under Test: This paragraph describes the systems/subsystems under test and includes a functional block diagram of the system and subsystems.

3.2 Interface Under Test: This paragraph contains a simplified block diagram with a functional description for each interface under test.

3.3 Test Setup: This paragraph contains a detailed block diagram of the test interfaces and setup. The diagram and text include all connection points, test points, and controls. All test equipment will be identified on the diagram with connection points.

3.4 Test Equipment: This paragraph contains a list of all test equipment required in the procedure, by manufacturer and part number; and includes an area to record serial number and calibration date. All test equipment functions will be defined.

3.5 Personnel: This paragraph identifies the personnel required to run the test (i.e., engineers, technicians, quality assurance personnel, test director, etc.).

3.6 Location: This paragraph identifies the location(s) where each test event related to the test procedure will occur.

Schedule: Schedule information is presented in relation to other program events. The schedule identifies a Test Readiness Review, test duration, and test debriefing time.

4.0 Test Conduct: This section is divided into the following paragraphs.

4.1 Safety Considerations: This paragraph provides a compilation of unique hazards anticipated. This paragraph includes any safety procedures to be followed, personal limits, protective equipment to be used, and authorities to be notified for each test. It also identifies a responsible test team member (safety officer) with authority to terminate testing.

4.2 Requirements Under Test: This paragraph lists all requirements under test by document name, paragraph number, and test.

4.3 Procedures: (Note: This section may be attached as an Appendix, if numerous procedures are required.) The test procedures will be written as detailed step-by-step instructions. Test procedures contain the following information:

a. Each step has an action step with the expected response to the action.

b. An exception to action steps is instructions to the tester, which will be defined as such.

c. Test procedure steps that validate requirements list the criteria and all requirements verified by the procedure.

d. Test procedures are written in logical units of work to facilitate resumption of testing after scheduled or unscheduled interruptions of testing.

e. Each action with an expected response contains an initial block for the government test director and/or government witness.

f. Each test and/or sub-test contains a sign-off sheet for the government test director and the contractor's test director.

4.4 Test Data Reduction and Analysis: The requirements and procedures for the reduction and analysis of test data are provided in this paragraph. Data to be recorded during the test, manually or automatically, are specified. Requirements for data recording and reduction are specified in a manner and detail such that the resulting information will clearly indicate whether or not the requirements have been met.

Appendix I: Content and Format of Quick Look Report

** This is template C-4 from the ***Test and Evaluation Process Guidelines (archived version 4/2010)*** document. Development Test has been replaced with Capability Evaluation.

Quick Look Reports: Quick look reports are provided to the Service Team within 10 to 15 calendar days following completion of the test. It is recognized that data analysis will not be complete and a full test report can not be provided because of the short turnaround. The quick look report provides management with a brief background on the test; a summary of test activities, including the test article configuration; the significant test results that are known at the time; and a preliminary test result synopsis or conclusions. At a minimum, the following sections from a CE Report format will be included:

1.0 Introduction:

2.0 Test and Evaluation Description:

3.0 Results and Discussion:

4.0 Synopsis/Conclusions:

5.0 Recommendations:

A matrix containing the following information may be used to summarize test results:

CE ISSUES MATRIX

Sequence Number	Criticality	Description of Issues	Proposed Solution

CRITICALITY: Low–Minimum risk or impact that can be fixed in a routine manner

Medium–Significant risk but can be worked around on a temporary basis

High–Mission critical risk, must be fixed prior to deployment

Appendix J: Content and Format of the Capability Evaluation (CE) and Performance Acceptance Test (PAT) Reports

** This is template C-7 from the ***Test and Evaluation Process Guidelines (archived version 4/2010)*** document. Development Test has been replaced with Capability Evaluation.

Note: The CE/PAT Test Report format is tailored to the type of test, and/or phase of testing required by contract (production acceptance site acceptance, factory acceptance, software, system, etc.).

Title Page: The title page contains the official name of the system, and the words "Test Report for_____" *(enter the specific test and test identifier)*" The title page contains the signature of the program manager and signatures of those responsible (e.g., Program Manager, Test Manager, and Quality Assurance Manager). The title page must be signed by all responsible prior to submittal for government review.

Test Summary: The Test Summary starts on a new page. The Test Summary contains a brief description of the test and the status of each requirement tested. The Test Summary describes any testing deferred and provides justification for deferral.

Table of Contents: The table of contents contains all major section headings.

1.1 Test Conduct: This paragraph contains a summary of test procedure changes that occurred during the test. Changes to procedures that will be used in future tests are incorporated prior to the next scheduled test. This paragraph defines the schedule and method of incorporating identified changes. It identifies test set-up changes or system configuration changes that occurred during the test and presents the rationale for the changes.

1.2 Participants: This paragraph contains the names of all participants and the functions they performed.

1.3 Data Collection and Analysis: This section explains how test data were collected and method of analysis used to obtain results.

2.0 Test Log: This section contains a copy of the actual test log developed during the test. Any discrepancy reports filed during the test and supporting data and documents developed during the test are attached to the test log.

3.0 Test Procedures: This section contains a copy of the test procedures used during the test. Each test procedure is signed by the government representative who witnessed the test.