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Data Warehouse
Functional Requirements Document
Version 2.0

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DATA WAREHOUSE
FUNCTIONAL REQUIREMENTS DOCUMENT

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1.0 OVERVIEW

1.1 Scope and Purpose

This document defines the data, hardware, and software functions directly involved in Oceanography and Geospatial Information and Systems data management using the Data Warehouse (DWH) at the Naval Oceanographic Office (NAVOCEANO). It states the functional, performance, interface, design and security requirements to be used to configuration manage the DWH System.

1.2 Life Cycle

This specification will be maintained throughout the DWH life-cycle. The approved version will be placed under configuration management control and subsequent changes or additions will be made in accordance with the procedures defined in the PMI CMP.

1.3 DWH Functional Description

DWH is the cornerstone of a NAVOCEANO initiative to address an office repository of collected and processed Oceanographic/Hydrographic and ancillary data. DWH includes the centralized storage and management of data resources to support a distributed processing environment. DWH addresses classified and unclassified data and information management, the security requirements needed to support production, and the configuration management required to ensure that quality products are developed using the DWH repository.

1.3.1 DWH DBMS

The DWH support software includes an Operating System, RDBMS, and CPTs. DWH provides a multi-user capability supported by centralized data ingest, storage, management, cataloging, backup, and archive functions. Users access DWH by logging into an assigned data server. Security checks between the local workstation and DWH appear transparent to the user. DWH services are presented to users through a Hypertext Markup Language (HTML) GUI which allows users to select and manage DWH services and processes. The GUI allows users to select data sets for viewing. Processing may occur within the DWH or on other workstations or servers.

1.3.2 DWH Networks

NAVOCEANO maintains two separate networks, classified and unclassified. These networks use switched Ethernet over twisted pair capability thus providing bandwidth to the desktop of a dedicated 10Mb with the capacity to bring a desktop to 100Mb capability. All DWH servers are connected via a Fiber Distributed Data Interface backbone.

1.4 DWH Implementation

With the delivery of the Integrated Database Management System (IDBMS) in 1993, NAVOCEANO introduced the capability to provide management of data and tools to enhance and automate NAVOCEANO production by providing access to a geo-referenced repository of data, information, and tools.

The NAVOCEANO DWH in its original design catalogued all data ingested into the database. The DWH then allowed data access, query processing and data retrieval. CPTs used throughout NAVOCEANO were also catalogued and made available to interested users. DWH supports analysis of databases in a client server environment of a myriad of workstations and products which may be generated and distributed from quality assured data which is centrally controlled and managed. DWH is part of NAVOCEANO PMI. It is supported by the NAVOCEANO Data Administrator and the Information Systems Division, which performs system administration, security administration, data base administration, network administration, configuration management, training and procurement.

1.4.1 DWH Baseline

The DWH Configuration Identification Manual reflects the baseline for DWH components. Configuration items are controlled by the DWH Configuration Review Board through a change request review process. This process is identified in the PMI CMP.

1.4.2 DWH Security

DWH is subject to the same security guidelines and policies as all of NAVOCEANO. Security keys embedded in the database control the access and distribution of the data.

2.0 APPLICABLE DOCUMENTS

The following documents form a part of this specification. In the event of conflict between the documents referenced herein and the content of this document, the following descending order of precedence shall apply:

- a. Military Standards, Specifications, and Regulations,
- b. Federal Standards and Specifications
- c. Commercial Standards and Specifications
- d. PMI CMP

2.1 Program Documents

- a. NAVOCEANO Programming Practices, Standards and Conventions, June 1996, RP 56
- b. PMI Operational Policies, Guidelines, and Constraints, November 1993, PMI-93-02
- c. PMI Common Production Tool Software Requirements Guideline, January 1994, PMI-93-06
- d. PMI CMP, November 1997, PMI-97-01
- e. DWH House Hardware, Software, & Documentation Configuration Identification Manual, January 2000
- f. System Design Document for DWH HTML GUI
- g. Programmers Design Document for DWH HTML GUI

2.2 Government Documents

- a. Government Open Systems Interconnection Profile (GOSIP) published as FIPS 146-1.0 Series, April 1991
- b. MIL-HDBK-419, Grounding Bonding and Shielding for Electronic Equipment and Facilities

... THE ... 1980, ELECTROMAGNETIC EMISSION AND
Susceptibility Requirements for the Control of Electromagnetic
Interference

- e. MIL-HDBK-217E, Electronic Equipment Reliability
- f. MIL-HDBK-472, Maintainability Prediction
- g. MIL-STD-756B, Reliability Modeling and Reductions
- h. World Geodetic System (WGS)-84, The Department of Defense WGS, Part II, Parameters and Graphics for Practical Applications

3.0 DWH FUNCTIONAL REQUIREMENTS

DWH shall include distributed workstations and servers to support the independent processing of classified and unclassified data and products. The hardware, software and network connectivity configuration of DWH shall be as documented in the DWH Configuration Identification Manual. DWH will provide multi-user data and software management services for distributed Oceanographic Information System (OIS) Oceanographic Support Subsystem (OSS) workstations and servers and OSS users. The data management and software management services are the means through which DWH will provide common central services to OSS users. Services will include network control and access control for all data or software managed by DWH. Physical storage of data or software may occur in any component of OSS. DWH will consist of both classified and unclassified systems which are isolated from each other.

3.1 DWH Catalog

The DWH Catalog will contain description and location information for all data, software functions and other information which can be accessed via DWH. The catalog will be tightly coupled to the DWH Physical Model and to the access control function. In addition, the catalog will contain description and location information for non-digital data, including hardcopy charts and microfiche.

3.1.1 Catalog Contents

The catalog will contain information about digital data resident on DWH and on the distributed workstations and servers. The catalog serves as the center of DWH. It is the focal point through which all information discovery is performed. It is the sole location where all NAVOCEANO data, and other assets, are documented on-line in a searchable digital format. Individuals loading data into DWH must ensure the loaded data, or other assets, are properly cataloged. It will contain information about software, both CPTs and other software subroutines and functions. The DWH shall provide the capability to store Catalog Data as specified in Table 3.1.2-1, Relational Data Base Holdings and Table 3.1.2-2 Non Relational Database Holdings in Appendix A.

3.1.1.1 Catalog of On-Line Data

The catalog shall contain the description and physical location of data stored on-line by DWH. Non relational data and digital products stored on-line and should be made available through a Software Common Production Tool. These and other non-digital products shall be cataloged and made available to DWH users.

3.1.1.2 Catalog of Off-Line Data

The catalog shall contain the description and physical location of data stored off-line or archived by DWH.

3.1.1.3 Catalog of Distributed Data

The catalog shall contain the description and physical location of data stored by any OSS component workstation and server.

3.1.1.4 Catalog of Non-Digital Data

The DWH catalog shall contain the description and physical location of non-digital data.

3.1.1.5 Catalog of CPTs

The catalog shall contain the description and physical location of CPTs.

3.1.1.6 Catalog of Software Subroutines and Functions

The catalog shall contain the description and physical location of software subroutines and functions.

3.1.1.7 Description of DWH Data

The DWH catalog shall provide the capability to include identification of primary and secondary keys in the description of DWH data sets.

3.1.1.8 Catalog of Non-DWH Data

The DWH catalog shall contain the description and physical location of Non-DWH data at the physical file level.

3.1.1.9 Indexing of Catalog Entries

The DWH shall provide the capability to index catalog entries by predefined user-selectable attributes.

3.1.2 Catalog Functions

The DWH catalog shall be accessible at a user workstation by means of a graphical use interface similar to "point and click." Query results shall be deliverable in the form of text files and graphical representations displayed on the querying workstation. The catalog will be a key element in providing transparent access to distributed data, and to commonly used software tools, subroutines, and functions. It will provide descriptive information about all data and software which a user is authorized to see. Authorization and access control will be at the security level of the particular session in which the request for information is made. The catalog function will also permit authorized users or application programs to update the catalog information.

3.1.2.1 Catalog Information Accessibility

The DWH catalog shall provide, on request, to users or to application programs acting for a user, the description and physical location of datasets or software tools, subroutines, or functions which have been authorized for release to the requesting user.

3.1.2.2 Selection by Geographic Area

The DWH catalog shall provide the capability to query the catalog information by geographic area, and return a list of datasets and files meeting the selection criteria.

3.1.2.3 Selection by Attributes

The catalog shall provide the capability to query the catalog information by index attributes and return a list of datasets, files, and/or software tools, subroutines, or functions meeting the selection criteria.

3.1.2.4 Manual Addition of Catalog Entries

The DWH catalog shall provide the capability for a user to add dataset or other acceptable catalog information to the catalog.

3.1.2.5 Automatic Addition of Catalog Entries

The DWH catalog shall provide the capability for an application program to add dataset information to the catalog.

3.1.2.6 Manual Modification of Catalog Entries

The DWH catalog shall provide the capability for a user to modify or delete dataset or other applicable information in the catalog.

3.1.2.7 Automatic Modification of Catalog Entries

The DWH catalog shall provide the capability for an application program to modify or delete dataset information in the catalog.

3.2 Graphical Display of Query Results

The DWH shall provide a graphical display of query results with the following capabilities:

- a. Display a map/chart background with latitude/longitude tics.
- b. The map/chart background shall be based on World Data Bank II data.

c. The map/chart background shall consist of filled polygons.

d. Display capabilities for the following projections/coordinate systems:

(1) Mercator

(2) Lambert

(3) Polar Sterographic

e. Display color-coded Minimum Bounding Rectangles (MBRs) and icons indicating the geographical location and type of data holdings for query results.

f. Display the current query region on the map/chart background.

g. Display icons and MBRs in the queried region for selected data types.

h. Show/hide selected data types.

i. Display with the graphical display a legend for definition of icons and MBR colors by data types.

j. Display attributes of the currently selected MBR or icon.

k. Display multiple map windows (overview map and detailed map).

l. Provide on-line help for users of the GUI.

m. GUI should be capable of running with various browsers.

n. GUI shall allow area selection with choice of rubber banding.

o. Allow user to query all data types for specific area in one data search.

p. Allow queries to include seasons and time periods of interest for data requests.

q. Display shall return units of measurement for data found that matches the user's request.

r. Allow additional filters to be added to an initial data query.

s. Provide geographic overlay of all the selected data types.

t. Provide means of differentiating different types of data.

u. Provide a shopping cart capability where user is allowed to select all files or data sets needed for a single download.

3.2.1 Graphical Selection of Query Results

The DWH shall provided the capability to graphically select query results as follows:

a. Zoom and pan the graphical display

b. Select a query area by MBR

c. Graphically select a single data item (MBR or icon)

d. Add/modify icons and the corresponding access capabilities.

3.3 Data Management

DWH will use the catalog and the DWH dictionary in managing data. It will provide users and application programs with transparent access to distributed data, i.e., a user or application program can retrieve and/or update data without knowing explicitly where the data exists. DWH data management will provide the capability for data ingest, or the receipt and preliminary processing of data, from sources external to NAVOCEANO, and from NAVOCEANO data collection systems. It will also provide the capability for electronic distribution of digital data. Access control will be enforced for all data management activities.

3.3.1 Database Contents

DWH will provide the capability to store and retrieve core data, which includes data used by multiple technical areas and data in standard formats, products prepared for external distribution and temporary datasets at intermediate steps in the production process.

3.3.1.1 Core Data

DWH shall provide the capability to store Core Data as specified in Table 3.1.2-1, Relational Data Base Holding in Appendix A and Table 3.1.2-2 Non-Relational Data Base Holdings in Appendix A

3.3.1.2 Products

DWH shall provide the capability to store digital products for external distribution.

3.3.1.3 Temporary Data

DWH shall provide the capability to store temporary data on-line, including user workfiles, products and files to support data ingest. Temporary data shall be sized at a minimum of 40 Gigabyte each for both the classified unclassified DWH.

3.3.1.4 Logical Content

The logical content of the core data and the catalog data to be stored in DWH shall be defined and maintained by the NAVOCEANO Data Administrator.

3.3.1.5 Physical Location of Data

DWH shall use on-line and off-line storage to support core data specified in Appendix A, Tables 3.1.2-1 and 3.1.2-2.

3.3.2 Data Management Functions

DWH will provide general data management capabilities using a DBMS and also manage access to non-DBMS files. Capabilities include data retrieval, data update (including add, change, and delete), backup and recovery, and archive and restore.

3.3.2.1 Data Retrieval

DWH shall provide the capability to retrieve data selected by location or geographic area, time of acquisition, platform, or data category.

3.3.2.2 Non-DBMS Data Selection

DWH shall provide the capability for a user or application program to select a non-DBMS file for retrieval or update from a list of files returned from the DWH catalog.

3.3.2.3 DBMS Data Update

DWH shall provide the capability for authorized users or authorized user's with application programs to update the DBMS data by adding, changing, or deleting records.

3.3.2.4 Non-DBMS Data File Update

DWH shall provide the capability for a user or application program to update a non-DBMS file by replacing an existing file with a new version of the file.

3.3.2.5 Data Ingest

DWH shall provide the capability to ingest data using devices for media as specified in Table 3.1.2-3, Ingest Data Requirements in Appendix A.

3.3.2.6 Data Distribution

DWH shall provide the capability for electronic distribution of data over the OSS network.

3.3.2.7 Data Backup

DWH shall provide backup and recovery services for data within DWH. It is the responsibility of the Data Custodians to backup the non-relational data files.

3.3.2.7.1 Backup of System and Applications files on DWH Systems

DWH shall provide the capability to automatically and manually backup and recover all DWH file systems by directory, file name, or project.

3.3.2.7.2 Interference

DWH shall be capable of executing both manual and automatic backups concurrently with file system transactions.

3.3.2.7.3 Incremental Backup

DWH shall have the capability to selectively backup files based on date/time of creation or last update.

3.3.2.7.4 Recovery

DWH shall provide the capability to selectively recover backed-up files within the retention policy set by the system administrator.

3.3.2.7.5 Data Archive

DWH shall provide the capability to archive and retrieve data files from active storage.

3.3.3 Software Management

The DWH catalog shall provide access to software (source code), including CPT and program libraries. Authorization to update DWH software will be subjected to configuration management control.

3.3.3.1 Retrieve Software Control

DWH shall provide the capability to retrieve a copy of a software tool, subroutine, or program from the CPT or a program library.

3.3.3.2 Update Software Module

DWH shall provide the capability to update cataloged copies of software tools, subroutines, or program CPTs or program libraries.

3.3.3.3 Execute Software Module

DWH shall provide the capability to execute a software tool or program selected from a CPT or program library.

3.4 DWH Operations

DWH shall support both on-line interactive processing and batch processing.

3.5 DWH Software

DWH software shall include operating systems, DBMS, Geographic Information Systems (GISs), CPTs and access to the Major Shared Resource Center (MSRC). Software may be unique to a single technical area or common to multiple technical areas. Users logged onto DWH shall be able to use a HTML GUI environment to access CPTs and obtain access to MSRC. CPTs are software applications that are accessible through DWH. Software requirements for operating systems, CPTs, user interfaces and access to MSRC are described in this section.

3.5.1 Operating Systems

DWH shall use implementation of the Unix Operating System where practical and shall support the FIPS Portable Operating System Interface for Computer Environments to achieve application program portability among different operating systems and hardware.

3.5.2 CPTs

CPTs used within DWH shall be executable on DWH, MSCR, or OSS workstations and servers as appropriate. The same application software shall be executable on both the classified and unclassified systems. CPTs shall provide multi-user production capability across OSS components for common activities such as track data editing, profile data editing or gridding. CPTs shall be accessible to users through DWH. A windowing environment as described in paragraph 3.5.12 shall be used to provide access to CPTs. The following CPTs are described in this section: (1) Model Software Library; (2) Mathematics Library; (3) Utility/Development Library; (4) GIS; (5) DBMS, and (6) Desktop Publishing System

3.5.3 Programming Services

Programming services to support DWH OSS applications software shall conform to the FIPS 151-1 and FIPS 158 components of the Application Portability Profile to achieve portability for COTS and in-house applications software. DWH must adhere to the guidance of Joint Chief of Staff Mobile Code Technology.

3.5.4 Model Software Library

The Model Software Library will include all currently used numerical modeling software approved for operational use, including the most current versions of the standard Navy acoustic models resident in the Oceanographic Atmospheric Master Library (OAML).

3.5.5 Mathematics Library

The Mathematics Library will include a set of standard, tested, and centrally maintained COTS software that applies to mathematics, statistics, numerical analysis and signal processing.

3.5.6 Utility/Development Library

The Utility/Development Library will contain COTS packages that support the development of applications source code, database maintenance and miscellaneous functions. This will include language compilers, debugging tools, text editors and Computer Aided Software Engineering (CASE) tools.

3.5.7 DBMS

The DWH DBMS shall be Oracle RDBMS. The DBMS shall be hosted on DWH and be available through client software.

3.5.8 CASE Tool Compatibility

DWH CASE tools will fully support the DeMarco, Yourdon/Constantine, Gane/Sarson, Jackson, and Warniew/Orr software development methodologies. The DBMS CASE tools will provide the capability to generate data flow diagrams, entity relationship diagrams, and state transition diagrams.

3.5.8.1 CASE Tool Graphic Interface

The DWH CASE tools will include an interactive graphic interface. The user will be able to define processes, data stores, data flows, and other design items in graphic forms. The graphic user interface will provide pan and zoom capabilities.

3.5.8.2 CASE Tool Data Dictionary

DWH CASE Tools will include an integrated data dictionary. The data dictionary will be automatically updated to reflect design elements created, deleted, or modified on the graphics interface.

3.5.8.3 Completeness and Consistency Checks

DWH CASE Tools will provide the capability to automatically perform completeness and consistency checks.

3.5.8.4 Code Generation

DWH CASE tools will include a code generation capability. This will include the capability to output DBMS-specific data structure on demand from a set of balanced design diagrams.

3.5.9 GIS

DWH shall host a GIS.

3.5.9.1 User Interface

The GIS user interface will support a multi-user capability and operate under the windowing environment as specified in paragraph 3.5.12. The GIS user interface will provide a command-driven interface, pull-down or pop-up menus, an ability to build customized menus, macros and shell scripts, on-line help, object-code libraries and an on-line users manual.

3.5.9.2 Database Creation Facilities

The GIS will provide the capability for database creation by conversion of existing digital data sets, manual digitization, scanning maps, charts, and photographs, and importing external data sets.

3.5.9.3 Data Formats

The GIS will support the import, export and conversion of data with the following formats: Vector Product Format, ASCII, ARC, DLG, DEM, DTED, DFAD, ELAS, ERDAS, GRASS, GCM, GPS, IGES, LANDSAT, MOSS, SIF, SLF, SPOT, TIGRIS, NET-CDF, DX90, MGD-77 and CEDD.

3.5.9.4 Error Detection

The GIS will provide error detection and interactive editing capability.

3.5.9.5 Data Types

The GIS will support raster and vector data types. The GIS will provide vector-to-raster and raster-to-vector conversions.

3.5.9.6 Coordinate Systems

The GIS will operate in the following coordinate systems: Latitude/Longitude, and Topocentric XYZ Coordinates including UTM, UPS, and Geocentric XYZ Coordinates.

3.5.9.7 Input Devices

The GIS will provide support for high speed scanners, tape drives and other devices.

3.5.9.8 Data Structures

The GIS will provide support, at a minimum, for the following data structures: Quadtree, Sphere Quadtree, Grid, and Triangulated Irregular Network (TIN).

3.5.9.9 Data Manipulation and Analysis Functions

The GIS will provide data manipulation and analysis functions for both raster and vector data. These functions will allow for database access, data restructuring, data transformations, datum translation, vector and raster overlay, raster cell operations, statistical analysis and supporting topology operations.

3.5.9.10 Database Access

The GIS at each workstation will provide database access to the local DBMS or through the interface with DWH. Access will be based on selection by geographic area or location, data category, feature names, and feature attributes.

3.5.9.11 Restructuring of Data

The GIS will provide for the restructuring of data from automated raster-to vector conversion and vice versa, the generation of topologically structured vector data, the compression and decompression of raster and vector data, the generation of contours from gridded or random z-value data points, the generation of contours from a TIN, and coordinate geometry operations.

3.5.9.12 Data Transformation and Projections

The GIS will provide data transformation capabilities such as: mathematical adjustment of vector or raster data to control points; least squares adjustment of standard geodetic and photogrammetric measurements; and rescaling of raster data values. The GIS will be capable of displaying, at a minimum, the following projections: Mercator, Transverse Mercator, Oblique Mercator, Transverse Central Cylindrical, Lambert Conformal Conic, Stereographic, Gnomonic, and Azimuthal Equidistant.

3.5.9.13 Datums

The GIS will be capable of translating between the following datums: Australian, South American 1969, Tokyo 1950, NAD 1927, NAD 1983, Indian, European 1950, WGS 1972, WGS 1984, Pulkova, and user-specified parameters.

3.5.9.14 Vector and Raster Overlay Functions

The GIS will provide the following Vector and Raster Overlay functions: Boolean and algebraic logic for vector or raster data, merge/dissolve, Thiessen polygon generation, ability to weight features, ability to superimpose one data category on another with replacement, and the ability to merge attribute information.

3.5.9.15 Raster Cell Operations

The GIS will provide raster cell operational capabilities such as assigning binary discrete, or real continuous values to a raster data set, and performing mathematical operations on one or more raster data sets.

3.5.9.16 Analytic and Statistical Functions

The GIS will provide analytic and statistical functions including buffer generation from point, line or area polygon features, computation of slope, interpolation of elevation, and development of cross-section profiles. The GIS will calculate distances, areas, perimeters, lengths, volumes, slopes, percent of total; perform polygon operations; provide terrain analysis; and generate descriptive statistics such as means, medians, algebraic map functions, and other statistical analysis tools such as regression and correlation.

3.5.9.17 Topology Operations

The GIS will provide for topology operations including: creation, spatial query by cursor input or coordinate input gridding, contouring, nearest-neighbor search, and network analysis.

3.5.9.18 Data Display and Product Generation

The GIS will display raster and vector data and produce cartographic products as a result of GIS operations.

3.5.9.19 Display Hardware

The GIS will generate displays for graphic terminals, digital plotters, and printers. The GIS will provide output device support for GKS, metafile, HPGL, X.11 and CGM.

3.5.9.20 Display Functions

The GIS shall be able to display both raster and vector data in the same display window. The GIS will provide display functions including pan, zoom and de-zoom and scroll. The GIS will support single and dual-screen capability and provide multiple

displays on a single screen using the same or different data sets. The GIS will display data of varying resolution within a geo-referenced area.

3.5.9.21 Three Dimensional Views

The GIS will generate three-dimensional perspective views of gridded surfaces.

3.5.9.22 Map Publishing

The GIS will be capable of producing graphics and text files which are compatible for input to the Desktop Publishing System.

3.5.10 DBMS

The DBMS shall be Oracle RDBMS. The DBMS shall be hosted on DWH and DWH distributed servers. The DBMS shall be compatible with the GIS.

3.5.11 Desktop Publishing System

DWH shall provide Framemaker as a desktop standard publishing system for the development and publication of products which shall integrate graphics from the GIS text.

3.5.12 User Interface

DWH shall use a windowing environment compliant with Open Software Foundation MOTIF providing the required software necessary for compliance guidance on mobile code technology.

3.5.13 Access to MSRC

Users of DWH shall have access to MSRC computing resources (subject to security access controls and need-to-know) through DWH via the NAVOCEANO network. Access to MSRC via DWH shall operate through the windowing environment specified in paragraph 3.5.12. When MSRC is accessed via DWH, the processing of access controls between the DWH and the MSRC shall be transparent to a user.

3.6 Security

3.6.1 General DWH Security

3.6.1.1 Required Measures

DWH security shall include measures to protect system components, data, and processes from unauthorized disclosure, modification, destruction and denial of service.

3.6.1.1.2 Isolation

DWH components shall be capable of being isolated and run in block mode to allow dedicated processing of data.

3.6.1.1.3 Access

DWH shall allow users to access only data or resources for which they have a need to know. Access control shall automatically prohibit a user's access to data and resources unless the user is explicitly authorized for those data and resources.

3.6.1.1.4 Unclassified Data

The design of DWH shall provide for unclassified data access to be controlled by the use of the same access procedures and safeguards as used for the control of classified data.

3.6.1.1.5 Internal Classification Markings

DWH components that process sensitive or classified data shall provide internal classification markings required by OPNAVINST 5510.1H

3.6.1.1.6 Balanced Assurance

DWH components shall not degrade the trust levels of the OIS or other components which make up DWH.

3.6.1.1.8 Network Security

DWH network security will meet the CCITT X.800 architecture and will implement all applicable GOSIP security options outlined in FIPS PUB 146-1, Appendix 1.

3.6.2 Security Policy

3.6.2.1 Access Control

3.6.2.1.1 Access Relationship

The DWH security mechanism shall define and control access between named users and named objects within the DWH environment.

3.6.2.1.2 Access Enforcement

The DWH shall provide enforcement mechanisms (e.g., self/group/public controls, access controls lists) that allow users to specify and control sharing of those objects by named individuals, or defined groups of individuals, or by both, and shall provide controls to limit propagation of access rights.

3.6.2.1.3 Access Protection

The DWH discretionary access control mechanism shall, either by explicit user action or by default, ensure that objects are protected from unauthorized access. These access controls shall be capable of including or excluding access down to the granularity of a single user.

3.6.2.1.4 Access Propagation

Access permissions to an object by users not already possessing access permissions shall only be assigned by authorized users.

3.6.2.2 Object Reuse

3.6.2.2.1 Denial of Access

The DWH shall ensure that all authorizations to information contained within a storage object shall be revoked prior to initial assignment, allocation, or reallocation to a subject from the pool of unused storage objects.

3.6.2.2.2 Denial of Information

No information produced by a prior subjects actions shall be available to any subject that obtains access to an object that has been released back to the system.

3.6.2.2.3 Labels

3.6.2.2.3.1 Label Maintenance

DWH shall have the capability of maintaining sensitivity labels associated with each subject and storage object under its control, at least to the file level, and exporting this label to printable output.

3.6.2.2.3.2 Label Assignment

In order to import non-labeled data, DWH shall request and receive, from a user, the security level and sensitivity of the data, and all such actions shall be auditable.

3.6.2.2.3.3 Label Definition

DWH shall have the capability of specifying the printable label names associated with exported sensitivity labels.

3.6.2.2.3.4 Label Display for Character Data Output

DWH components shall mark the beginning and end of human readable, paged, hardcopy output (e.g., line printer output) with human-readable sensitivity labels that represent the sensitivity of the output.

3.6.2.2.3.5 Label Display for Graphical Data Output

DWH components shall mark other forms of human readable output (e.g., maps, graphics) with human readable sensitivity labels that represent the sensitivity of the output.

3.6.2.2.3.6 Label Construction

Sensitivity labels shall be a combination of hierarchical classification levels (e.g., unclassified, confidential, and secret) and non-hierarchical categories (e.g., Not Releasable to Foreign Nationals, PROPIN, For Official Use Only).

3.6.2.2.3.7 DWH Database Table Security Label

DWH database tables shall contain a security label attribute that associates a security label with each row in all DWH database tables. The capability to display this security label

attribute with each row returned from a DWH table shall be provided.

3.6.2.2.4 Accountability

3.6.2.2.4.1 Identification and Authentication

3.6.2.4.1.1 User Identification

The DWH shall require users to identify themselves by ID and password before enabling actions that the security is expected to mediate.

3.6.2.4.1.2 User Authentication

The DWH shall use a protection mechanism (e.g., password) to authenticate the user's identity.

3.6.2.4.1.3 Authentication Data Protection

The DWH shall protect authentication data so that it cannot be accessed by unauthorized users.

3.6.2.4.1.4 Unique Identification

The DWH shall be able to enforce individual accountability by providing the capability to uniquely identify system users.

3.6.2.4.1.5 User Traceability

The DWH shall provide the capability to associate the identity of a user with auditable events listed in paragraph 3.6.2.4.2.3 initiated by that individual.

3.6.2.4.1.6 Label Override Traceability

DWH shall be able to audit any override of human-readable output markings.

3.6.2.4.2 Audit Trails

3.6.2.4.2.1 Management

The DWH shall create, maintain, and protect from modification, unauthorized access, and/or destruction, the audit trail of access to objects that it protects.

3.6.2.4.2.2 Accessibility

The DWH shall protect the audit trail so that read access is limited to those who are authorized from audit data.

3.6.2.4.2.3 Auditable Events

The DWH shall be able to record the following type of events as they occur (not to be interpreted as byte-at-a-time):

- a. Use of identification and authentication mechanisms,
- b. Introduction of objects in a user's address space,
- c. Deletion of objects,
- d. Actions taken by computer operators and system administrators and/or system security officers,
- e. Identification of the starting and ending times of each network access event,
- f. Identification of security-relevant exceptional conditions (e.g., potential violation of data integrity, such as misrouted datagrams) detected during the transactions between two hosts,
- g. Changing the configuration of the network (e.g., a component leaving the network and rejoining).

3.6.2.4.2.4 Event Capture

For each recorded event, the audit record shall identify:

- a. Date and time of the event,
- b. User,
- c. Type of event,

- d. Completion of the event, and
- e. Origin of identification and authentication events.

3.6.2.4.2.5 Object Capture

The DWH Trusted Computing Base shall include in the audit record the name of the object for events that introduce an object into a user's address space and for object deletion events.

3.6.2.4.2.6 User Capture

The DWH system administrator shall be able to selectively audit the actions of one or more users based on individual identity.

3.6.2.4.2.7 Centralization

DWH shall provide a centralized audit data storage and retrieval capability.

3.6.2.4.2.8 Synchronization

A method of correlation shall be available if the total audit requirement is met by the use of more than one audit log.

3.6.2.5 Assurance

3.6.2.5.1 System Architecture

3.6.2.5.1.1 Secure Domain

The DWH shall maintain a domain for its own execution that protects it from external interference or tampering (e.g., by modification of its code or data structure).

3.6.2.5.1.2 Resource Control

Resources controlled by the DWH shall be a defined subset of the subjects and objects in the system.

3.6.2.5.1.3 Resource Protection

The DWH shall isolate the resources to be protected so that they are subject to the access control and auditing requirements.

3.6.2.5.1.4 Process Isolation

The DWH shall maintain process isolation through the provision of distinct address spaces under its control.

3.6.2.5.2 , System Integrity

Hardware and/or software features shall be provided that can be used to validate the operation of the hardware and firmware elements of the DWH as defined in this specification.

3.6.2.5.3 Trusted Facility Management

DWH will support separate operator and administrator functions.

3.7 Performance Requirement

TBD

3.8 Batch Processing

DWH shall accept batch Processing.

3.9 User Profile

The following information is provided to profile DWH users:

3.9.1 Definition of User and Customer

The DWH "user" is the general population that enters the DWH via the NAVOCEANO Home page on the WEB server. DWH "customers" are U.S. Navy employees or contractors with a valid identification and password assigned by the DWH security manager. An individual may be assigned multiple Ids and passwords. The privileges and accesses for each ID and password may vary. Whenever the word "user" is used in this specification, it refers to a single active ID/password account. DWH shall accommodate a minimum of 4000 ID/password accounts.

3.9.1.2 Profile of Customer Activities

DWH will support the following mix of customer activities during periods of both nominal and peak loading:

<u>Activity</u>	<u>% of Users</u>
Use of Catalog	30%
Use of DBMS	30%
Access to MSRC	20%
Batch Processing	10%
Backup and Recovery	10%

A single customer shall be able to initiate and control up to four on-line interactive activities simultaneously. A customer shall be able to conduct multiple catalog and DBMS activities simultaneously. Seventy percent of customers will be on the classified system and thirty percent of the customers will be on the unclassified system.

3.10 Loading

3.10.1 Nominal Loading

Nominal loading is defined as DWH usage during normal working hours with 80 users active, uniformly spread across the Information Systems connected to DWH.

3.10.2 Peak Loading

Peak loading is defined as DWH usage during normal working hours with 120 users/customers active, uniformly spread across the systems connected to DWH.

3.11 Normal Working Hours

The normal hours for operation of DWH are a 24-hour workday seven days a week, federal holidays excluded.

3.12 Performance During Periods of Degraded Operation

DWH shall continue to operate in degraded mode during periods of component downtime and will support as many functions as possible.

3.13 External Interface Requirements

The external interface requirements for DWH shall be implemented in accordance with applicable Interface Control Documents approved by the DWH Change Review Board.

3.14 Design Requirements

The design requirements for DWH are provided in the following paragraphs:

3.14.1 COTS

COTS hardware and software will be used where practical for DWH.

3.14.2 Best Commercial Practice

All shore-based DWH components shall be designed and constructed using best commercial practice.

3.14.3 Software

3.14.3.1 COTS Software Updates

If during the life-cycle of DWH, a later version of COTS software is released by the vendor, the NAVOCEANO Information System Department shall evaluate the later version for possible incorporation into DWH. The results of the evaluation shall be submitted to the DWH Configuration Control Board in accordance with the provisions of the PMI CMP. Regression testing shall be performed to ensure that the new COTS software is compatible with other components of DWH.

3.14.3.2 Developed Software

Software developed for DWH shall be written in accordance with NAVOCEANO Programming Practices, Standards, and Conventions.

3.14.4 Health and Safety Criteria

The design shall include safety features to reduce or eliminate hazards to personnel and/or equipment. The DWH design shall avoid all use of dangerous and flammable materials.

3.14.8 Environmental Requirements

DWH shall be designed and constructed to meet the environmental conditions specified below without degradation.

3.14.8.1 Temperature

DWH shall be designed to operate within an ambient temperature range from 60 to 80 F degrees and tolerate a maximum rate of change of 12 degrees F per hour.

3.14.8.2 Humidity

DWH shall be designed to operate within a relative humidity range of 35 to 65%.

3.14.8.3 Transportability

DWH equipment design and packaging techniques shall ensure that no performance degradation or mechanical damage shall occur resulting from exposure to the conditions normally encountered in fork-lift handling, transport by aircraft, or shipment by truck traveling over improved roads. All equipment shall be designed to be accessible for installation and modification at its intended operational location. Shipping containers shall not exceed the following external dimensions: 1.54 meters wide, 1.38 meters deep, and 2.15 meters high.

3.14.8.4 Electrical Power

All equipment shall operate from either a source of 120 volt, 60Hz, single phase; 208 volt, 60 Hz single phase or a 220 volt, 60 Hz, 3 phase power at the point of use.

3.14.8.5 Installation Requirements

The weight of equipment shall not exceed the floor loading constraints at NAVOCEANO. The DWH components shall be designed to be compatible with the available floor space in Room 200, Building 1000, which shall be no less than 200 square feet.

Appendix A.

TBD

Media

3.5" Floppy Diskette
5.25" Floppy Diskette
8mm Exabyte Tape
4mm Tape
CD ROM
8.5" x 11" Hardcopy Sheet

Table 3.1.2-3 Data Warehouse Supported Media

ACRONYMS

CASE	Computer Aided Software Engineering
CMP	Configuration Management Plan
COTS	Commercial Off The Shelf
CPTs	Common Production Tools
DBMS	Data Base Management System
DWH	Data Warehouse
FIPS	Federal Information Processing Standard
GIS	Geographic Information System
GOSIP	Government Open Systems Interconnection Profile
GUI	Graphical User Interface
HTML	Hypertext Markup Language
MBRs	Minimum Bounding Rectangles
MSRC	Major Shared Resource Center
NAVOCEANO	Naval Oceanographic Office
OAML	Oceanographic Atmospheric Master Library
OIS	Oceanographic Information System
PMI	Production Modernization Initiative
RDBMS	Relational DBMS
TIN	Triangulated Irregular Network
WGS	World Geodetic System

18 August 2000

From: A. Spencer (N62)

Subj: DWH Functional Requirements Document

1. The attached file contains the DWH Functional Requirements and is designated version 2.0.