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Description: *DRAFT*

Requirements

Description: Purpose

This chapter details the requirements of the NEPTUNE Data Management and Archiving System. Input has been gathered from a number of sources and documents, specifically [2], [4], [5] [8] and [7].

Description: Overview

This chapter describes the requirements of the DMAS which can be easily identified. These requirements were developed from available information without doing any detailed requirements analysis. The identified requirements will only represent a subset of the total requirements of the DMAS.

For this document, the user requirements were extracted from NEPTUNE and VENUS documentation and studies, and represent the requirements for the DMAS as previously documented. The system requirements have been “reverse engineered” from the functional description in Chapter 4, and represent our current assumptions about the requirements of the DMAS. The weak relationship between user requirements and system requirements is reflected

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in Table 1 on page 20 and Table 2 on page 25.

Description: **User Requirements**

The user requirements are the requirements as stated by the potential users of the system describing the goals of the system from a user's point of view, essentially a user's wish list for the system. The requirements have been extracted from the NEPTUNE documentation and studies, primarily [2], and [4]. We do not believe that the requirements listed here are a complete description of the required functionality, and we have planned a series of science working group meetings as part of the full design process to assist in completing this list.

For each user requirement listed in this chapter, the following details are given:

Identifier. Each user requirement is tagged with a unique identifier to allow tracing through subsequent phases. The format consists of UR followed by the category number which is separated from the requirement number by a period, e.g. UR1.1.

Source. The origin of each user requirement is stated. This can be an individual or a document.

Short Description. A short descriptions given to summarise the requirement. A more extended description follows if this is needed to define the requirement unambiguously.

Description: **General Requirements**

Description:

Description: [2]

Description: The system must be as user friendly and as transparent as possible, particularly for new user populations.

Description: The user interfaces intended for use by external users should not present a barrier to inexperienced users of the DMAS.

Description:

Description: [2]

Description: User friendliness/opacity must apply to both ends of the system.

Description: User friendliness/opacity must apply to both the back end (instrument installation, data/meta-data collection) and front end (information retrieval) of the system.

Description:

Description: [4] (p.32)

Description: Reliability.

Description: NEPTUNE will be operational 24 hours per day. The DMAS will be designed to allow continuous operation.

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Description: [4] (p.33)

Description: The design will handle faults.

Description: The DMAS will be capable of automatically reconfiguring itself to suppress fault propagation, and will automatically recover from faults.

Description:

Description: [4] (p.33)

Description: COTS products are preferred to the greatest extent practical.

Description: COTS hardware and software are less expensive to acquire and maintain, and generally more reliable than custom designed products, and should therefore be used in preference to custom hardware and software.

Description:

Description: [4] (p.33)

Description: Elements which are not COTS will be extensively tested.

Description:

Description:

Description: [8] (p. 17, UsR6.3)

Description: The DMAS shall be capable of unattended operation.

Description: The DMAS will be manned during normal working hours, and operate unattended at other times.

Description:

Description: [4] (p.33)

Description: The system will be affordable.

Description: NEPTUNE is on a budget, and the DMAS must fit into its share of the budget.

Description:

Description: [4] (p.32)

Description: The design process will follow good management practices.

Description: The design process will allow oversight by NEPTUNE, with appropriate reporting reviews, and milestones.

Description:

Description: John Garrett, John Madden

Description: The design will allow for phased growth and funding of NEPTUNE.

Description: The American and Canadian funding of NEPTUNE, and the funding of the MARS and VENUS prototypes are each separate, and are each seeking funding from several sources. This situation creates the possibility that only a part of NEPTUNE may be funded.

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Description: The design will allow for independent funding of VENUS, NEPTUNE, and MARS.

Description: The NEPTUNE related projects are independently funded. The design and implementation of the VENUS DMAS will allow the project to proceed if either or both of the MARS and NEPTUNE projects are not funded. If MARS, NEPTUNE or both are funded, then the design will allow VENUS DMAS development to be shared with these projects.

Description:

Description: [4] (p.32)

Description: The DMAS will support community and Privileged Users.

Description: The science experiments supported by NEPTUNE can be subdivided into two classes: those for long-term, community wide science, and those proposed and developed by Privileged Users. The DMAS will support both of these types of experiments and users.

Description:

Description: [4] (p.70)

Description: The DMAS will support Public and Commercial Outreach.

Description: DMAS will be able to routinely generate and make easily accessible derived information products in addition to the scientific raw data products specified by the research community. These products will support both public outreach activities, and commercial use of NEPTUNE data.

Description:

Description: [4] (p.33)

Description: Standard Internet protocols will be adopted for data transport and commands.

Description:

Description:

Description: [4] (p.33)

Description: Plug and play environment.

Description: The DMAS will provide a plug and play capability, allowing new types of instruments to be incorporated into the system.

Description:

Description: [4] (p.33)

Description: The DMAS will be designed to use technology that will be available in 2003.

Description:

Description:

Description: [4] (p.37)

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Description: The DMAS will support multiple shore landings.

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Description:

Description: [8] (pg 7, Sect 2.4.5)

Description: The VENUS DMAS will be capable of future expansion.

Description: The VENUS DMAS will be capable of future expansion at three levels:

Description: researchers or instrument developers will be able to attach new or complementary equipment to the VENUS nodes;

Description: the DMAS will allow links or integration with existing and planned ocean databases;

Description: incorporation of VENUS within the larger NEPTUNE system.

Description: User Interaction Requirements

Description:

Description: [4] (p.33)

Description: NEPTUNE users will see a single point of contact.

Description: If the DMAS is implemented as a distributed system, NEPTUNE users will see a single point of contact, allowing access to all NEPTUNE data and services.

Description:

Description: [4] (p.33, p.62, p.64)

Description: Real-time data will be available.

Description: All data are available in near-real-time, however some data may be subject to proprietary data restrictions (see UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.).

Description:

Description: [4] (p.33, p.62)

Description: Data quality control will be done on real-time data.

Description: Data QC/QA will be specified prior to installation of experiments. The DMAS will be responsible for implementing QC/QA for both real-time data, and for data stored in the archive.

Description:

Description: [4] (p.33, p.64)

Description: Data from Privileged User experiments is subject to a proprietary period.

Description: Real-time data from Privileged User experiments are handled as per sponsor policy. Access to data from Privileged user experiments will be enabled after an established proprietary period (or sooner if authorized by the Privileged user).

Its probably a bad idea to allow multiple policies. It would be better to say only

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Privileged Users can get real-time proprietary data. The DMAS would only allow public access to real-time data if the Privileged User declares the data to be non-proprietary.

Description:

Description: [4] (p.61)

Description: Access will be via electronic or human interfaces.

Description: Access to the archive for output to the Privileged User or the public may be via electronic means, or human.

Note that human interfaces are expensive and electronic data transfer is much more efficient and immediate.

Description:

Description: [4] (p.62,64-65)

Description: The archive interfaces will be a user-friendly and web based.

Description:

Description:

Description: [4] (p.63)

Description: The archive will have a flexible user interface.

Description: The archive UI will be flexible enough to accommodate queries which have not been anticipated during DMAS design and implementation.

Description: Archive Requirements

Description:

Description: [4] (p.61)

Description: Design for storage technology migration.

Description: Design the system in such a way as to allow the archive to be migrated from one storage technology to another (for example, from magnetic tape to optical disk) without interrupting the archiving process nor the retrieval process.

Description:

Description: [4] (p.61)

Description: Capability to deliver data products to users.

Description: This will involve either pre-calculating the data products and storing them in the archive, or doing the processing needed to generate the data products on-demand.

Description:

Description: [4] (p.46)

Purpose

Description: Meta-Data will be archived with the data.

Description:

Description:

Description: [4] (p.47)

Description: Automatically adjust the database structure.

Description: It should be possible to automatically adjust the structure of the database that holds the NEPTUNE data as the instrumentation changes.

Description:

Description: [4] (p.56)

Description: Data will be archived.

Description: The data archive preserves both the raw data originating from NEPTUNE instruments, and the meta-data describing these data.

Description:

Description:

Description: Some of the raw data will be processed before being archived.

Description:

Description:

Description: [4] (p.64)

Description: Events will be extracted from data and stored in the archive.

Description: The DMAS will support an event, feature and pattern detection processing, and will allow the detected events, features, and patterns to be stored in the archive.

Description:

Description: [4] (p56, 65)

Description: Standard data formats will be used.

Description: The archive will store and deliver data in standard formats. Where possible existing formats will be used. Web centric standards such as XML are preferred.

Description:

Description: [4] (p62)

Description: Only selected data will be archived.

Description: NEPTUNE will develop a policy for determining which data will be archived. This will include sub-sampling, sub-setting, and lossy compression. The DMAS will implement that policy. The purpose of this is to make archiving NEPTUNE data affordable.

Description:

Description: [4] (p.63)

Description: Models can be stored in the archive.

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Description: Data models generated by PIs can be stored in the NEPTUNE archive, and distributed to archive users.

Description:

Description: [4] (p.63)

Description: A stream oriented processing perspective to support the modelling community.

Description: **What does this mean?**

Description:

Description: [4] (p.63)

Description: The DMAS will be flexible enough to take advantage of new database developments prior to the activation of the array.

Description:

Description:

Description: [4] (p.33,p.62)

Description: The archived data will have quality information.

Description: Data stored in the archive will undergo QC/QA analysis, and the results will be stored in the archive catalogues.

Description: **System Interface requirements**

Description:

Description: [4] (p.62)

Description: Define interface requirements for experiment designers.

Description: Define standards for packaging and transmitting data from sensors to shore stations and all interface requirements for experiment designers.

Description:

Description: [4] (p.62)

Description: Shore stations will need buffering capability.

Description: Buffers at the shore station will avoid data loss if their Internet connection is interrupted. The shore stations will be capable of buffering **n** days of data.

Description: **Instrument Sequencing**

Description:

Description: [4] (p.33, 64)

Description: Event driven data acquisition.

Description: The DMAS will accommodate event driven data acquisition, and will be capable of detecting events in real-time and automatically reconfiguring the system in response to

Purpose

events. Events may be detected in video streams. Responses might include increasing sample rates for related data, activating additional observing sequences, etc.

Description:

Description: [4] (p.46)

Description: The DMAS must support the entire range of instrument types deployed in NEPTUNE.

Description: Some likely NEPTUNE instruments produce data at very low data rates and will require a minimum of user interaction (for example setting sampling rates). Other instruments, such as tethered bottom rovers with HDTV, video cameras and manipulators may create up to 20Mb/s of data on a continuous basis and will require extensive user interaction involving closed loop control. Between these extremes, there lies a range of instrument types with disparate data rate and control requirements. The DMAS must support the entire range of instruments.

Description:

Description: [4] (p.46)

Description: Data latency.

Description: The maximum time from reception at the shore station to re-transmission to a user is TBD.

Note that this is hard to describe. Are we talking about CTD data, sub-sampled low-resolution video, or full HDTV? Can this be supported with a priority scheme? We probably need a table of datatype & priority, vs allowed latency.

Description:

Description: [4] (p.46)

Description: The DMAS must allow for expansion to as-yet-unimagined instruments.

Description:

Description:

Description: [7]

Description: Military shutdowns.

Description: The military may need to shut down instruments in the NEPTUNE array for short periods of time. This would include both shutting down instruments in an area at a specific time, and random shutdowns of instruments. This requirement is only known to apply to hydrophone equipment.

This requirement has many unknowns attached to it:

Description: What is the interface between NEPTUNE and the military?

Description: *Is this something that is controlled by NEPTUNE staff, or will there be a connection to the NEPTUNE network and somebody external to NEPTUNE controls things.*

Description: What kind of assurance is required that the instruments have in

fact been shut down?

Description: **Does this affect the level of security that must be supported in terms of the DMAS software, staffing of development and operations, etc.?**

Description: **Would delaying release of some data, rather than shutting down an instrument be adequate?**

Description: System Requirements

These requirements describe the functions which the system must perform in order to allow a user to achieve the user requirements. The System requirements have the following characteristics:

Description: The requirement is unambiguous

Description: Each requirement is complete, and the complete set of requirements describe all functionality required from the system.

Description: The correct implementation of the requirement is verifiable in a practical and affordable way.

Description: Each requirement is self consistent, and is consistent with the other requirements of the system.

Description: The requirement is easily modifiable. This implies the requirements are well organized and contain a minimum level of redundancy.

Description: The requirement is traceable. This implies the origin of the requirement is clearly identified, and the requirement can be identified in all documents which are based on the software requirements.

Description: Usable during the operations and maintenance phase of the software life cycle.

The system requirements listed here have been reverse-engineered from the top-level activities described in Chapter 4, and not extracted from the user requirements. Since these requirements have not been derived directly from the user requirements, and since our knowledge of the user requirements is incomplete, the system requirements are certainly incomplete.

The relationships between the user requirements from Section 2, and the user requirements in this section are shown in Table 1 on page 20 and Table 2 on page 25.

User Requirement to System Requirement Cross Reference

UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.

SR1.4 Real-time data streams will be available from any NEPTUNE instrument.

SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.

SR1.7 Groups of instruments can be controlled together.

SR1.8 The DMAS will perform resource management.

<p>SR1.10 The DMAS will be able to accept real-time data from external sources.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p> <p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.9 Meta-data will be included with all data stored in the archive and delivered to users.</p>
<p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.4.2 It will be possible to restrict access to proprietary real-time data and status to Privileged Users.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>SR1.7 Groups of instruments can be controlled together.</p> <p>SR1.8 The DMAS will perform resource management.</p> <p>SR1.10 The DMAS will be able to accept real-time data from external sources.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p> <p>SR3.3 Turnaround time for data requests.</p> <p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.7</p> <p>SR3.9 Meta-data will be included with all data stored in the archive and delivered to users.</p>
<p>UR1.3 Reliability.</p> <p>SR1.8 The DMAS will perform resource management.</p> <p>SR1.9 The DMAS will provide status and control interfaces for to other NEPTUNE systems.</p>
<p>UR1.3.1 The design will handle faults.</p>

	<p>SR1.8 The DMAS will perform resource management.</p> <p>SR1.9 The DMAS will provide status and control interfaces for to other NEPTUNE systems.</p>
UR1.3.2	COTS products are preferred to the greatest extent practical.
UR1.3.3	Elements which are not COTS will be extensively tested.
UR1.3.4	The DMAS shall be capable of unattended operation.
UR1.4	The system will be affordable.
UR1.5	The design process will follow good management practices.
UR1.6	The design will allow for phased growth and funding of NEPTUNE.
UR1.6	The design will allow for independent funding of VENUS, NEPTUNE, and MARS.
UR1.7	<p>The DMAS will support community and Privileged Users.</p> <p>SR1.1 Privileged Users will be granted permission to access the NEPTUNE observatory.</p> <p>SR1.2 Organizations will be able to get privileged access to NEPTUNE data.</p> <p>SR1.3 Public Users will be granted access to the NEPTUNE observatory on an individual basis.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.4.2 It will be possible to restrict access to proprietary real-time data and status to Privileged Users.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>SR1.6.1 Privileged Users can control instruments.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p> <p>SR3.4 The NEPTUNE archive will store processed files generated by Privileged Users, and make the files available to archive users.</p> <p>SR3.5 The NEPTUNE archive will store catalogue data generated by Privileged Users, and make the catalogues available to archive users.</p>

<p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.7</p> <p>SR3.8 Privileged Users will be able to retrieve proprietary data.</p>
<p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>SR1.3 Public Users will be granted access to the NEPTUNE observatory on an individual basis.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p> <p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.7</p>
<p>UR1.9 Standard Internet protocols will be adopted for data transport and commands.</p>
<p>UR1.10 Plug and play environment.</p> <p>SR1.7 Groups of instruments can be controlled together.</p>
<p>UR1.11 The DMAS will be designed to use technology that will be available in 2003.</p>
<p>UR1.12 The DMAS will support multiple shore landings.</p> <p>SR1.8 The DMAS will perform resource management.</p>
<p>UR1.13 The VENUS DMAS will be capable of future expansion.</p>
<p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>SR1.3 Public Users will be granted access to the NEPTUNE observatory on an individual basis.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>SR1.6.1 Privileged Users can control instruments.</p>

<p>SR1.10 The DMAS will be able to accept real-time data from external sources.</p> <p>SR2.1 The DMAS will provide user interfaces.</p> <p>SR3.2 The DMAS will provide web based interfaces to allow the NEPTUNE archive to be queried, and to allow data to be retrieved from the archive.</p> <p>SR3.11 Data from external archives will be available via the NEPTUNE archive.</p>
<p>UR2.2 Real-time data will be available.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.4.2 It will be possible to restrict access to proprietary real-time data and status to Privileged Users.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p>
<p>UR2.2.1 Data quality control will be done on real-time data.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p>
<p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p> <p>SR1.1 Privileged Users will be granted permission to access the NEPTUNE observatory.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.4.2 It will be possible to restrict access to proprietary real-time data and status to Privileged Users.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>SR3.7</p> <p>SR3.8 Privileged Users will be able to retrieve proprietary data.</p>
<p>UR2.3 Access will be via electronic or human interfaces.</p>

<p>SR1.2 Organizations will be able to get privileged access to NEPTUNE data.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>SR1.6.1 Privileged Users can control instruments.</p> <p>SR2.1 The DMAS will provide user interfaces.</p> <p>SR3.2 The DMAS will provide web based interfaces to allow the NEPTUNE archive to be queried, and to allow data to be retrieved from the archive.</p> <p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.7</p>
<p>UR2.4 The archive interfaces will be a user-friendly and web based.</p> <p>SR3.2 The DMAS will provide web based interfaces to allow the NEPTUNE archive to be queried, and to allow data to be retrieved from the archive.</p> <p>SR3.3 Turnaround time for data requests.</p>
<p>UR2.5 The archive will have a flexible user interface.</p> <p>SR3.2 The DMAS will provide web based interfaces to allow the NEPTUNE archive to be queried, and to allow data to be retrieved from the archive.</p> <p>SR3.7</p>
<p>UR3.1 Design for storage technology migration.</p>
<p>UR3.2 Capability to deliver data products to users.</p> <p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.7</p> <p>SR3.8 Privileged Users will be able to retrieve proprietary data.</p>
<p>UR3.3 Meta-Data will be archived with the data.</p>

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<p>SR3.9 Meta-data will be included with all data stored in the archive and delivered to users.</p>
<p>UR3.4 Automatically adjust the database structure.</p>
<p>UR3.5 Data will be archived.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p>
<p>UR3.6 Some of the raw data will be processed before being archived.</p> <p>SR3.12 The DMAS archive will do automated data processing.</p>
<p>UR3.6.1 Events will be extracted from data and stored in the archive.</p> <p>SR1.5</p> <p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>SR3.12 The DMAS archive will do automated data processing.</p>
<p>UR3.7 Standard data formats will be used.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p> <p>SR3.7</p> <p>SR3.10 All data stored in the archive and delivered to users will be in a standard format.</p>
<p>UR3.8 Only selected data will be archived.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p>
<p>UR3.9 Models can be stored in the archive.</p> <p>SR3.4 The NEPTUNE archive will store processed files generated by Privileged Users, and make the files available to archive users.</p> <p>SR3.4.1 User Submitted data will be attributed to the submitting user.</p>
<p>UR3.10 A stream oriented processing perspective to support the modelling community.</p>
<p>UR3.11 The DMAS will be flexible enough to take advantage of new database developments prior to the activation of the array.</p>
<p>UR3.12 The archived data will have quality information.</p> <p>SR3.12 The DMAS archive will do automated data processing.</p>

<p>UR4.1 Define interface requirements for experiment designers.</p> <p>SR1.6.1 Privileged Users can control instruments.</p> <p>SR1.7 Groups of instruments can be controlled together.</p>
<p>UR5.1 Event driven data acquisition.</p> <p>SR1.5</p> <p>SR1.5.1 Detected events can automatically effect instrument sequences.</p> <p>SR1.8 The DMAS will perform resource management.</p> <p>SR1.10 The DMAS will be able to accept real-time data from external sources.</p>
<p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.6</p> <p>SR1.6.1 Privileged Users can control instruments.</p> <p>SR1.7 Groups of instruments can be controlled together.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p>
<p>UR5.2.1 Data latency.</p> <p>SR4.3 Near-real-time data flow latency.</p>
<p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p> <p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>SR1.5</p> <p>SR1.5.1 Detected events can automatically effect instrument sequences.</p> <p>SR1.6</p> <p>SR1.6.1 Privileged Users can control instruments.</p>

<p>SR1.7 Groups of instruments can be controlled together.</p> <p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p>
<p>UR5.4 Military shutdowns.</p> <p>SR1.2 Organizations will be able to get privileged access to NEPTUNE data.</p>

System Requirement to User Requirement Cross Reference

<p>SR1.1 Privileged Users will be granted permission to access the NEPTUNE observatory.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p>
<p>SR1.2 Organizations will be able to get privileged access to NEPTUNE data.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p> <p>UR5.4 Military shutdowns.</p>
<p>SR1.3 Public Users will be granted access to the NEPTUNE observatory on an individual basis.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p>
<p>SR1.4 Real-time data streams will be available from any NEPTUNE instrument.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>UR2.2 Real-time data will be available.</p> <p>UR2.2.1 Data quality control will be done on real-time data.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p>

<p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR1.4.1 Outside users will be able to monitor the status of any NEPTUNE instrument.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>UR2.2 Real-time data will be available.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p> <p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR1.4.2 It will be possible to restrict access to proprietary real-time data and status to Privileged Users.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR2.2 Real-time data will be available.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p>
<p>SR1.5</p> <p>UR3.6.1 Events will be extracted from data and stored in the archive.</p> <p>UR5.1 Event driven data acquisition.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>

<p>SR1.5.1 Detected events can automatically effect instrument sequences.</p> <p>UR5.1 Event driven data acquisition.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR1.5.2 Users can register interest in events detected in NEPTUNE data.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>UR2.2 Real-time data will be available.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p>
<p>SR1.6</p> <p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR1.6.1 Privileged Users can control instruments.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p> <p>UR4.1 Define interface requirements for experiment designers.</p> <p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR1.7 Groups of instruments can be controlled together.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p>

<p>UR1.10 Plug and play environment.</p> <p>UR4.1 Define interface requirements for experiment designers.</p> <p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR1.8 The DMAS will perform resource management.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.3 Reliability.</p> <p>UR1.3.1 The design will handle faults.</p> <p>UR1.12 The DMAS will support multiple shore landings.</p> <p>UR5.1 Event driven data acquisition.</p>
<p>SR1.9 The DMAS will provide status and control interfaces for to other NEPTUNE systems.</p> <p>UR1.3 Reliability.</p> <p>UR1.3.1 The design will handle faults.</p>
<p>SR1.10 The DMAS will be able to accept real-time data from external sources.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>UR5.1 Event driven data acquisition.</p>
<p>SR2.1 The DMAS will provide user interfaces.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p>
<p>SR3.1 The DMAS will provide a long-term archive of selected data produced by NEPTUNE.</p>

<p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>UR3.5 Data will be archived.</p> <p>UR3.7 Standard data formats will be used.</p> <p>UR3.8 Only selected data will be archived.</p> <p>UR5.2 The DMAS must support the entire range of instrument types deployed in NEPTUNE.</p> <p>UR5.3 The DMAS must allow for expansion to as-yet-unimagined instruments.</p>
<p>SR3.2 The DMAS will provide web based interfaces to allow the NEPTUNE archive to be queried, and to allow data to be retrieved from the archive.</p> <p>UR2.1 NEPTUNE users will see a single point of contact.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p> <p>UR2.4 The archive interfaces will be a user-friendly and web based.</p> <p>UR2.5 The archive will have a flexible user interface.</p>
<p>SR3.3 Turnaround time for data requests.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR2.4 The archive interfaces will be a user-friendly and web based.</p>
<p>SR3.4 The NEPTUNE archive will store processed files generated by Privileged Users, and make the files available to archive users.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR3.9 Models can be stored in the archive.</p>
<p>SR3.4.1 User Submitted data will be attributed to the submitting user.</p> <p>UR3.9 Models can be stored in the archive.</p>
<p>SR3.5 The NEPTUNE archive will store catalogue data generated by Privileged Users, and make the catalogues available to archive users.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p>

<p>SR3.6 The Public Users will be able to search for public data in the NEPTUNE archive.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p> <p>UR3.2 Capability to deliver data products to users.</p> <p>UR3.6.1 Events will be extracted from data and stored in the archive.</p>
<p>SR3.7</p> <p>UR1.2 User friendliness/transparency must apply to both ends of the system.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR1.8 The DMAS will support Public and Commercial Outreach.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p> <p>UR2.3 Access will be via electronic or human interfaces.</p> <p>UR2.5 The archive will have a flexible user interface.</p> <p>UR3.2 Capability to deliver data products to users.</p> <p>UR3.7 Standard data formats will be used.</p>
<p>SR3.8 Privileged Users will be able to retrieve proprietary data.</p> <p>UR1.7 The DMAS will support community and Privileged Users.</p> <p>UR2.2.2 Data from Privileged User experiments is subject to a proprietary period.</p> <p>UR3.2 Capability to deliver data products to users.</p>
<p>SR3.9 Meta-data will be included with all data stored in the archive and delivered to users.</p> <p>UR1.1 The system must be as user friendly and as transparent as possible, particularly for new user populations.</p>

Purpose

UR1.2 User friendliness/transparency must apply to both ends of the system.
UR3.3 Meta-Data will be archived with the data.
SR3.10 All data stored in the archive and delivered to users will be in a standard format.
UR3.7 Standard data formats will be used.
SR3.11 Data from external archives will be available via the NEPTUNE archive.
UR2.1 NEPTUNE users will see a single point of contact.
SR3.12 The DMAS archive will do automated data processing.
UR3.6 Some of the raw data will be processed before being archived.
UR3.6.1 Events will be extracted from data and stored in the archive.
UR3.12 The archived data will have quality information.
SR4.1 The DMAS will be able to handle the projected NEPTUNE data flow.
SR4.1.1
SR4.2 Expected archive usage.
SR4.3 Near-real-time data flow latency.
UR5.2.1 Data latency.
SR4.4 Total near-real-time data flow.
SR4.5 Real-time data consumers
SR4.6 Archive data ingest rates
SR5.1 Proprietary data files will not be accessible without appropriate privileges.
SR5.2 Instrument control will be protected from unauthorized access.

For each requirement listed in this chapter, the following details are given:

Identifier. Each user requirement is tagged with a unique identifier to allow tracing through subsequent phases. The format consists of UR followed by the category number which is separated from the requirement number by a period, e.g. UR1.1.

Source. The origin of each user requirement is stated. In a formal design document this would

Purpose

be one of the user requirements listed in Section 2., however, these requirements have not been derived in the usual way and so the source has been left blank.

Short Description. A short description given to summarise the requirement. A more extended description follows if this is needed to define the requirement unambiguously.

Verification. An indication of how this requirement may be verified. The verification is included mainly to ensure that there is a reasonable way to verify that requirements have been met (system requirements which cannot be verified are not good system requirements), however they could also be used in developing a system verification and test document.

Description: General Requirements

The requirements in this section describe the general requirements for the DMAS.

Description:

Description:

Description: Privileged Users will be granted permission to access the NEPTUNE observatory.

Description: The DMAS subsystem will be able to grant privileges to NEPTUNE users. These privileges could include one or more of the following:

Description: Access to proprietary data from a specific list of instruments, for a specific period of time.

Description: The ability to control specific instruments.

Description: The ability to contribute processed data and catalogue information to the NEPTUNE archive.

Description: The ability to create customized event handling tasks, which may modify the operation of selected instruments.

The mechanism for determining if a user should be granted special privileges will be based on NEPTUNE policy, **which will be stated here. For now, we will assume that projects will be assigned a project id, a list of access and control privileges, and a secret password. Any user who can provide the password will be granted the privileges.**

Will it be necessary to have levels of privilege associated with the same project? For instance, a project may have a small set of collaborators permitted to send commands to an experiment, and a larger set of collaborators permitted to access the proprietary data associated with the project.

Description: Demonstrate using the DMAS user interfaces to gain privileged access to the NEPTUNE observatory.

Description:

Description:

Description: Organizations will be able to get privileged access to NEPTUNE data.

Purpose

Description: NEPTUNE may choose to distribute selected data to outside organizations. When NEPTUNE policy determines that data should be distributed to an organization, the DMAS will be able to support this distribution (e.g. forwarding data to the IRIS DMC).

Data to be distributed to each organization will be selected by a list of instruments, and/or a list of instrument types.

Data may either include proprietary data, or proprietary data may be excluded until it becomes public.

Description: Demonstrate distribution of data to privileged organizations.

Description:

Description:

Description: Public Users will be granted access to the NEPTUNE observatory on an individual basis.

Description: The DMAS hardware and software systems may not have the capacity to handle unlimited public access to non-proprietary NEPTUNE data. To limit public access to data, the DMAS will be able to categorize Public Users in the following ways:

Description: The general public, with no special access permission.

Description: Professionals who should be permitted to access all non-proprietary data.

NEPTUNE will determine a policy on which data will be accessible to the general public, and what the minimum requirements are for access to all non-proprietary data. The NEPTUNE policy will be documented here.

Description: Demonstrate the DMAS user interfaces used by professionals and the general public. Demonstrate that any restrictions on access to the general public meet NEPTUNE policy.

Description:

Description:

Description: Real-time data streams will be available from any NEPTUNE instrument.

Description: Outside users will be able to access a real-time data flow from any instrument using either user interfaces, and a publicly documented API. **Does this have to include “context” information when a user connects to a real-time data stream, e.g., when a data stream is created, download the last n hours of data, and then add new data to the end?**

Description: Demonstrate using the DMAS user interfaces to monitor real time data streams from a selection of instruments. Provide working example code which uses the public API to access data streams.

Description:

Description:

Description: Outside users will be able to monitor the status of any NEPTUNE instrument.

Description: Status monitoring should include both a “complete current status” output, and an

Purpose

ongoing status update stream. Status will only be available subject to proprietary data restrictions. Status will be available through both DMAS user interfaces, and a publicly documented API.

Description: Demonstrate using the DMAS user interfaces to monitor instrument status. Provide working example code which uses the public API to monitor instrument status.

Description:

Description:

Description: It will be possible to restrict access to proprietary real-time data and status to Privileged Users.

Description: Access to proprietary information will be granted based on project id and password. Any user who can provide the project password will be granted access to the proprietary data. NEPTUNE policy will determine when NEPTUNE staff will have access to proprietary data.

Is it possible to declare the data from one instrument to be proprietary to several projects?

Description: Demonstrate the DMAS user interfaces and API support allowing privileged users to monitor real time data and status.

Description:

Description:

Description: Event detection.

Description: The DMAS will run event detection software. The event detection software may be created and defined by NEPTUNE staff, by instrument providers, or by Privileged Users. Some of the event detection software may run in the water, some may run at the NEPTUNE operations centre, and some may be run by privileged users outside of NEPTUNE.

Description: Use test data raw containing known events to demonstrate the monitoring of the input stream, to show that the events are correctly detected, that a notification of the event and where appropriate, notification of the end of the event will be propagated to software interested in the events.

Description:

Description:

Description: Detected events can automatically effect instrument sequences.

Description: The event detection software will provide real-time notifications to instrument control software which has registered interest in a given type of event. The instrument control software will then take appropriate actions in response to the event.

Description: Provide sample code which subscribes to data events, and modifies instrument configuration when events are detected.

Description:

Description:

Description: Users can register interest in events detected in NEPTUNE data.

Purpose

Description: Event detection should probably be available through an instruments UI, and a public API, and maybe through a simple email system as well. There will be categories of events which will be available, and the user will register interest in a set of these events.

Description: Demonstrate using the DMAS UI to register interest in events, and show how the events will be displayed. Provide sample software which uses the public API to be notified of events.

Description:

Description:

Description: NEPTUNE operations staff can control instruments.

Description: There will be a GUI for each instrument with basic functions TBD.

Description: Demonstrate the DMAS GUI controlling instruments.

Description:

Description:

Description: Privileged Users can control instruments.

Description: Using the same GUI as SR1.6. This may require a conflict resolution mechanism.

Description: Same as SR1.6.

Description:

Description:

Description: Groups of instruments can be controlled together.

Description: A selected group of instruments can be configured as a single “virtual” instrument, with a single control interface. Instrument groups can have automatic sequencing. Instrument groups can register interest in classes of events, respond to any events detected (see SR1.5). Instrument group controllers may be developed by NEPTUNE staff, or they may be developed by Privileged Users.

Is there any need for instrument group event detection, e.g., when instrument a has values > x and instrument b has values < y, declare an event?

Description: Create an example scenario consisting of a group of instruments. Demonstrate using the DMAS GUI to control the instruments as a group. Provide sample code which uses the DMAS API to control the group of instruments.

Description:

Description:

Description: **The DMAS will perform resource management.**

Description: In a resource limited system, it may be necessary to prioritize activities to fit within the available power and network bandwidth. Note that this activity will involve considerable interaction with other systems, and may therefore need to be partially, or completely moved to an overall observatory control system.

Because of the relatively simple topography of the VENUS arrays, a simplified resource allocation model will be adequate:

Purpose

Description: It will be assumed that communications bandwidth will be adequate for all instruments to be active simultaneously.

Description: There will be a pre-determined upper limit on the power available from each shore station.

Description: There will be a pre-determined upper limit on the power available from each node.

Description: There will be a pre-determined upper limit on the power available from each instrument port.

Description: Infrastructure power consumption will be ignored.

Description: Transmission line power losses will be ignored.

When commands sent to the DMAS might cause an overload situation, the commands will not be executed, and the DMAS operators will be notified.

Description: Demonstrate creating a simulated power overload situation at a instrument port, node, and shore station.

Description:

Description:

Description: The DMAS will provide status and control interfaces for to other NEPTUNE systems.

Description: The DMAS will have an API which allows other NEPTUNE systems to retrieve DMAS status, and to control NEPTUNE instruments. The purpose of this interface is to allow an observatory control system to monitor the health and state of the DMAS, and to allow other system to send command like “shut down all instruments on node x”. The details of the interface are described in ICD TBD.

Description: Provide example code which demonstrates the functionality of ICD TBD.

Description:

Description:

Description: The DMAS will be able to accept real-time data from external sources.

Description: Some of the raw data needed to detect the events described in SR1.5 may only be available from instruments which are not part of the NEPTUNE array, but may be available from other data sources (for example, if NEPTUNE does not include instruments to measure wind speed, wave height, etc., the data may be available from other agencies),. The DMAS will be able to accept data from these other sources, and incorporate the data into the NEPTUNE data flow.

Description: Provide working sample code which incorporates data from an external data source. The data source will be selected in consultation with NEPTUNE.

Description: User Interface

The requirements in this section describe the requirements on the DMAS user interfaces.

Description:

Description:

Purpose

Description: The DMAS will provide user interfaces.

Description: The DMAS will provide the infrastructure to support web based interfaces for instrument control and real time data display.

Description: Provide working examples of instrument control and data display software.

Description: Archiving

The requirements in this section describe the requirements on the archiving component of the DMAS.

Description:

Description:

Description: The DMAS will provide a long-term archive of selected data produced by NEPTUNE.

Description: Practical considerations prevent us from archiving all data. For example, some video data will have to be discarded, and it may not be necessary to archive data that is sent to other archive centres (i.e. seismic data). NEPTUNE policy will determine which data will be archived.

Description: Use simulated instrument data to demonstrate the data flow to the DMAS archive. Demonstrate that the data filtering and forwarding matches VENUS policy.

Description:

Description:

Description: The DMAS will provide web based interfaces to allow the NEPTUNE archive to be queried, and to allow data to be retrieved from the archive.

Description: Demonstrate using the DMAS archive interface to query the catalogues and retrieve the data.

Description:

Description:

Description: Turnaround time for data requests.

Description: The processing time from when a data request is first received, until the user is notified that data are ready to be retrieved will be less than **n** hours plus **m** minutes per megabyte of data requested. Any time needed for data processing will be in addition to this time.

Description: Create a set of simulated data requests of various sizes. Demonstrate that the requests are processing in the required time.

Description:

Description:

Description: The NEPTUNE archive will store processed files generated by Privileged Users, and make the files available to archive users.

Description: There will be a mechanism for Privileged Users to submit processed data files to the archive. The data will be catalogued, and available to other archive users. (See also SR6.4.)

Description: Demonstrate using the DMAS archive user interface to submit data files to the archive. The demonstration will include showing that the data become available to other DMAS

Purpose

archive users.

Description:

Description:

Description: User Submitted data will be attributed to the submitting user.

Description: The NEPTUNE archive will attribute user generated data to the Privileged User who generated the data.

Description: Demonstrate that provenance of user submitted data files is clearly documented when the files are retrieved by archive users.

Description:

Description:

Description: The NEPTUNE archive will store catalogue data generated by Privileged Users, and make the catalogues available to archive users.

Description:

Description: Demonstrate using the DMAS archive user interface to submit catalogue data to the archive. The demonstration will include showing that the data become available to other DMAS archive users.

The nature of catalogue data will have to be specified.

Description:

Description:

Description: The Public Users will be able to search for public data in the NEPTUNE archive.

Description:

Description: Demonstrate using the DMAS archive interface to search for data.

We have to define useful and achievable search criteria here. Example may be location, and date. Other possibly useful searchers would include data content (e.g. find all images which contain a fish, find all CTD records with temp > 10°C).

The response to a search will be useful information about the archive content matching the query. We have to define what useful information is, and it may be different for each instrument type.

This assumes that meta-data is public.

Description:

Description:

Description: The Public Users will be able to retrieve non-proprietary data from the NEPTUNE archive.

Description: This includes a users selection from:

Purpose

Description: Raw data collected by the instrument.

Description: Calibrated data collected by the instrument.

Description: Calibration information.

Description: Meta-data.

Description: Processed data automatically generated by the archive centre.

Description: A selection of data products appropriate for the type of data.

Description: Demonstrate using the DMAS archive to submit a variety of sample requests. Each of the user options will be executed.

We may have to limit who can do this to avoid swamping the data retrieval infrastructure.

Description:

Description:

Description: Privileged Users will be able to retrieve proprietary data.

Description: The types of proprietary data available will include everything listed in SR3.7. Access to proprietary data will be granted to selected data, based on NEPTUNE policy (see SR6.2).

Description:

Description:

Description: Meta-data will be included with all data stored in the archive and delivered to users.

Description:

Description: Demonstrate that data retrieved by users includes all associated meta data.

This conflicts with SR3.7, which allows users to select meta-data to be included when retrieving data. The best solution may be some happy medium. For example Meta-data might include date and time, location, a photograph of the deployment site, a photograph of the instrument at the site (at least for fixed instruments), charts and hydrographic information from the region, calibration data, deployment and recovery logs, etc. Some basic information could be included by default, with all of the rest included on demand.

Description:

Description:

Description: All data stored in the archive and delivered to users will be in a standard format.

Description: The archive will use or develop standard formats for data products. XML will be used as the basis for any new formats developed by the NEPTUNE archive.

Description: Create a set sample requests. The requests should retrieve data from each of the instrument types supported by NEPTUNE. Demonstrate that each of the data types is in a NEPTUNE approved standard data format.

Purpose

Description:

Description:

Description: Data from external archives will be available via the NEPTUNE archive.

Description: In order to provide “single stop shopping”, data stored in external archives which is complimentary to the data in the NEPTUNE archive will be available through the NEPTUNE archive. This might include data collected by nearby weather buoys, satellite images, etc.

Description: Create a set of sample requests which includes data from both NEPTUNE instruments, and from an external archive. Provide documentation describing how new external archives would be interfaced with the NEPTUNE archive.

Description:

Description:

Description: The DMAS archive will do automated data processing.

Description: The DMAS archive will be able to process data for user requests, to automatically pre-generate data products, and to augment the archive catalogues with derived results.

Description: Test data will be created which triggers automated data processing to populate catalogues and generate data products. Sample user requests for processed data will be created and executed.

Description: Data Flow Requirements

The requirements in this section describe the data flow which the deployed DMAS will be expected to handle.

Description:

Description:

Description: The DMAS will be able to handle the projected NEPTUNE data flow.

Description: The projected data flow from NEPTUNE is 280Mb/s average, and 1000Mb/s peak. The projected data flow from VENUS is 26Mb/s average and 185Mb/s peak.

These numbers should be verified, and are probably subject to change.

Are the VENUS number per shore station or overall?

It would be nice to put an upper limit on the data flow requirements. There must be some upper limit to the amount of data the cable can carry?

Description:

Description:

Description: The DMAS will be scalable.

Description: The DMAS will be designed to “scale down”, if lack of funding limits the size of the NEPTUNE array. The DMAS will be designed to “scale up”, if future growth of the network extent, or instrumentation increases the data rates beyond the predictions.

Purpose

The scaling primarily refers to operational hardware, it is unlikely that the development costs for the DMAS will be changed significantly by scaling either way.

Description:

Description:

Description: Expected archive usage.

Description: The archive will be designed to handle up to **n** requests for data per day, and to deliver up to **nn** Gigabytes of data per day to archive users. All data will be delivered via the internet.

Description:

Description:

Description: Near-real-time data flow latency.

Description: The latency of the near-real-time data flow, from the time data is received by the shore station, to the time the data is transmitted to the user will be less than **TBD** seconds,

TBD% of the time.

Description:

Description:

Description: Total near-real-time data flow.

Description: The DMAS will be designed to support a total near-real-time data flow (the sum of the data flow to each near-real-time data consumer) of more than **TBD** Mb/s (delivered to users).

Description:

Description:

Description: Real-time data consumers

Description: The DMAS will be designed to support up to **TBD** simultaneous real-time data consumers.

Description:

Description:

Description: Archive data ingest rates

Description: The archive will be designed to handle an initial data rate of 280 Terabytes per year for the NEPTUNE array, 29 Terabytes per year for the VENUS array. See also SR4.1.1.

Description: Security

Description:

Description:

Description: Proprietary data files will not be accessible without appropriate privileges.

Purpose

Description:

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Description:

Description: Instrument control will be protected from unauthorized access.

Description: Requirements on other NEPTUNE Systems

These requirements must be met by NEPTUNE systems other than DMAS in order for the DMAS to meet its requirements. Ideally, this should be further divided into requirements on specific NEPTUNE systems, however that cannot be done until all NEPTUNE systems are clearly defined.

Description:

Description:

Description: NEPTUNE instruments will be accessible over the network.

Description: All instruments in the NEPTUNE network will be accessible from the NEPTUNE shore station. Communication with the instruments will be accomplished by the instrument discovering, a shore station server, and opening a bi-directional socket to the shore station server. All data from the instrument will be sent to the shore station server as a string of bytes on the socket. Any strings of bytes sent to the instrument by the shore station server will be interpreted by the instrument as commands. The interface to the shore station server may be implemented by a separate interface module (the NEPTUNE SIIM).

Description:

Description:

Description: In the event of shore station server failure, NEPTUNE instruments will attempt to discover and connect to an alternate server.

Description:

Description:

Description:

Description: NEPTUNE must provide information allowing control of privileges

Description: The DMAS requires the existence of a NEPTUNE body that would grant privileges, determine when data should be proprietary, which Privileged Users can control instruments, and set proprietary periods for data. The DMAS needs to know the kinds of directives that will come out of the body. (i.e. what parameters define the bounds of privileges).

For example, it seems likely this body would issue directives like “for six months, starting at some date in the near future, data from instrument x is proprietary to project y, with a public release date of 1 year from the date the data was collected”, but does the DMAS also have to support directives like “All data from near bottom CTD’s, collected within 2 days before or after a magnitude 4 or greater earthquake is proprietary to project y”.

Purpose

Privileges must somehow be associated with individuals.

For the Gemini Telescopes, this is done by assigning a project id, with an associated password. Any individual that can supply the password is granted the privileges. NEPTUNE could define privileges, assign a project id and password, and then distribute the project id and password to project team members. The DMAS would be responsible for granting the assigned privileges, and assigning the project id to appropriate data.

Description:

Description:

Description: NEPTUNE will provide a policy on NEPTUNE staff access to proprietary data.

Description: It will be necessary for NEPTUNE operations staff, archive staff, and instrument developers to have access to proprietary data in order to perform their duties. NEPTUNE must provide a policy which will determine when proprietary data access will be granted, what uses are acceptable with the data, and what enforcement mechanisms will be in place. (Note that trusting staff to obey a written policy has no cost, and all other enforcement measures have significant cost and will effect the design of the DMAS.)

Description:

Description:

Description: NEPTUNE will provide a policy on data processed by Privileged Users

Description: If Privileged Users are permitted to contribute processed data to the NEPTUNE archive, NEPTUNE must document NEPTUNE's requirements on the content of the Privileged User processed data. This would include the meta-data content, documentation of the data, references to any publications, etc.

Description:

Description:

Description: The NEPTUNE power system will provide status information.

Description: The power system will provide an interface which will allow the DMAS to determine if activating an instrument or group of instruments will be ok from the power system's point of view.

Description:

Description:

Description: The NEPTUNE communications system will provide status information.

Description: The communications system will provide an interface which will allow the DMAS to determine if activating an instrument or group of instruments will be ok from the communications system's point of view.

Description:

Description:

Purpose

Description: NEPTUNE must establish working agreements with external archives.

Description: The archive centre may require agreements with external archives to allow the exchange of data. The archive centre must either have the authority to make these agreements, or the NEPTUNE controlling body must enter into these agreements on behalf of the archive centre.

Description:

Description:

Description: The NEPTUNE power system can control individual instruments.

Description: The DMAS expects to be able to turn power on and off to individual instruments via commands sent to the NEPTUNE power system.