



OCEAN
OBSERVATORIES
INITIATIVE

CONFIGURATION MANAGEMENT PLAN

Version 5-00
Document Control Number 1000-00000
2018-09-11

Woods Hole Oceanographic Institution
Woods Hole Road, Woods Hole, MA.
www.whoi.edu

in Cooperation with

University of Washington
Oregon State University
Rutgers University

Configuration Management Plan

Document Control Sheet

Version	Date	Description	Originator
1-0	Jun 16, 2006	Initial integration	S. Williams
2-0	Oct 15, 2007	Complete Revision	A. Ferlaino
2-1	Oct 30, 2007	Threshold Update	A. Ferlaino
2-2	Oct 30, 2007	Threshold Update	S. Williams
2-3	Nov 13, 2007	Terminology	A. Ferlaino
2-4	Nov 16, 2007	Comment Updates	A. Ferlaino
2-5	Jan – 2008	Major update	SE group
2-56	Apr 29, 2008	Revision	A. Ferlaino
2-64	May 28, 2008	Revision Chapters 5-6	A. Ferlaino
2-66	May 28, 2008	Clerical Corrections	A. Ferlaino
2-70	Jun 9, 2008	Formal Review Comment Update	A. Ferlaino
2-71	Jun 20, 2008	Section 2.6 Changes	A. Ferlaino
2-73	Jun 27, 2008	Formatting	A. Ferlaino
2-74	Aug 11, 2008	Document Properties	A. Ferlaino
2-75	Aug 25, 2008	Version formatting, section 1-7 change to convention	A. Ferlaino
2-76	Sep 22, 2008	Clerical Correction	A. Ferlaino
2-77	Oct 6, 2008	Collaboration Tools, update of naming conventions, inclusion of attachment B2, correction to CCB	A. Ferlaino, P. Yeung
2-78	Oct 9, 2008	Formatting, clerical corrections	L. Snow
2-79	Oct 10, 2008	Mike Harrington directed RCA example changes, Section 1	A. Ferlaino
2-81	Oct 22, 2008	1.8.2 graphic, 1.8.4, 5.3.1, 5.3.3 text	A. Ferlaino
2-82	Jan 22, 2009	Section 6.5, Appendix A-2: Change OOI CCB Chairperson to OOI Program Director. Move OOI Project Director to OOI CCB Members list. 1.5, 1.6, 3.4.5, 3.4.10, 3.5.2.1, 3.5.2.2, 3.5.2.3: copy edits	E. Griffin
2-83	Jan 26, 2009	Section 7.3.2 text added re: Risk Management Board	L. Brasseur
2-84	Jan 30, 2009	Appendix A-1, minor title description edits.	A. Ferlaino
2-85	Oct 29, 2009	Updated pre baseline	A. Ferlaino, B. Bergen, M. Goodnight
2-86	Nov 15, 2009	NSF Directed changes to CCB membership and address change in OL management structure. Update of tools references including Alfresco structure. Variant impact changes.	A. Ferlaino
2-87	Nov 19, 2009	1.2 R&RA Scope, Scope in naming convention	A. Ferlaino
2-88	Nov 20, 2009	CCB Lien update	A. Ferlaino, ECR # 1300-00030
2-89	May 25, 2010	Section 1.9 updates corresponding to B2 table	K. Carr, ECR # 1300-00075

Configuration Management Plan

		updates	
2-90	Sept 2, 2010	Major Update for CCB	E. Chapman, ECR#1300-00090
2-91	Oct 10, 2010	Edits to Sec 6.3, 6.4, and 7.2 based on CCB feedback.	E. Chapman, ECR#1300-00090
2-92	Feb 7, 2011	Edits to 3.4.10 and Section 5.	E. Chapman
3-00	Feb. 18, 2011	Major Update, edits to Sections 1.7.1, 1.7.2, 1.9, 2.11.2, 3.0, 3.5.2.2, 4.2.1, 7.0, 7.1, Appendices	E. Griffin, ECR #1300-00126
3-01	June 9, 2011	Edits and clarifications to Sections 1.6, 1.7, 1.8, 2.7, 6.2.3, 6.4, 6.5, 7.3.2, 7.4, 7.5, and Appendix A-1	E. Griffin, E. Chapman
3-02	June 15, 2011	Clarified drawing title block statement in 2.7	E. Chapman
3-03	July 14, 2011	Updates to Sections 1.8.1, 7.4, removal of Appendix A-1, administrative changes.	E. Griffin, ECR #1300-00179
3-04	August 5, 2011	Updates to Sections 6.4, 7.2, 7.3, 7.5, and 7.6; changed position titles to reflect actuals used in the PMO throughout the document.	G. Settle and E. Griffin, ECR #1300-00192
3-05	Oct. 20, 2011	Edits to sections 1.8, 3.5, 6.2, 7.2, 7.5	E. Griffin
3-06	Oct. 21, 2011	Addition to 1.4; minor word changes, copy edits	G. Settle
3-07	Oct 21, 2011	Section 6.2.4; additional edits to sections 6.2.1, 6.2.2, 6.4, 7.1, 7.1.3, 7.3.1, 7.5	E. Griffin, A. Ferlaino, E. Chapman
3-08	Nov 15, 2011	Resolving liens ECR 1300-00192	E. Griffin
3-09	Nov 29, 2011	Resolving liens ECR 1300-00192	E. Griffin
3-10	Dec 1, 2011	Edits to Sections 2.9, 2.10, 2.11	E. Griffin
3-11	Dec 6, 2011	Resolving liens ECR 1300-00192	E. Griffin
3-12	Dec 9, 2011	Formatting	E. Griffin, ECR #1300-00192
3-13	Dec 23, 2011	Administrative edit on Document Control Sheet	E. Griffin
3-14	Mar 9, 2012	Updates to Sections 1.5, 1.10	E. Griffin
3-15	Mar 13, 2012	Updates to Sections 3.4, 3.5, 6.3, 6.4	E. Griffin
3-16	Mar 28, 2012	Working off liens	E. Griffin, ECR #1300-00237
3-17	Mar 30, 2012	Completion of liens	E. Griffin, ECR #1300-00237
3-18	Dec 14, 2012	Completion of NSF Liens	E. Chapman, ECR #1300-00237
3-19	Dec 21, 2012	Formatting, copy edits	E. Griffin
3-20	Mar 19, 2013	Administrative updates, corrections to Sections 1.7.2, 1.8.1, 6.2.1, 6.4, 6.5, 7.3.1.	E. Griffin
3-21	April 3, 2013	Updates to Sections 4.5.1.3, 7.3.1	K. Carr, ECR #1300-00356
3-22	April 9, 2013	Changed language in 7.3.1 per comment on ECR 1300-00356	K. Carr, ECR #1300-00356
3-23	Aug 8, 2013	Administrative change. As-Build TDP due as part of Commissioning not Acceptance.	E. Chapman
3-24	Oct 28, 2013	Updates to CI CM section.	T. Cowles

Configuration Management Plan

3-25	Jan 7, 2014	Admin Change- clarify language in 6.2.1.e and 6.2.2.d	E. Chapman
4-01	Oct. 15, 2014	Major Update for Transition to O&M	P. Matthias, S. White
4-02	May 12, 2015	Finalize for End of Construction	D. Penn
4-03	May 19, 2015	Addition of CGSN and Cabled Array CMP documentation	S. Banahan
4-04	May 19, 2015	Addition of Cabled Array document and software instructions.	S. Banahan
4-05	Oct 02, 2015	Various Updates needed for the O & M phase.	J. Pisciotta
4-05	Dec 11, 2015	Various Updates needed for the O & M Redmine.	J. Pisciotta
4-05	April 1, 2016	Additional Updates needed for the O & M Redmine changes.	J. Pisciotta
5-00	Sept. 11, 2018	Refresh for OOI 2.0, with input from all IOs.	P. Matthias

**Configuration Management Plan
Table of Contents:**

1	Configuration Management System Structure	8
1.1	Purpose	8
1.2	Scope.....	8
1.3	Configuration Process	8
1.3.1	Drawing Standard	8
1.3.2	Software Versioning and Configuration Process	8
1.3.3	Implementing Organization Documentation Assurance Process	9
1.3.4	Implementing Organization Configuration Management Process	9
1.4	Responsibility & Authority	9
1.5	Configuration Controlled Documents.....	11
1.6	File Formats and Applications	11
1.7	File Naming Conventions (Non-Controlled).....	12
1.7.1	Terms and Definitions	12
1.8	File Numbering Conventions (Controlled)	12
1.8.1	Series Number	12
1.8.2	Sequence Number.....	13
1.8.3	Control Assignment Validation Criteria	14
1.8.4	Controlled Files Outside of the DMS	14
1.9	Other Naming Conventions	14
1.9.1	Observatory - Instrument Name	14
1.10	Technical Data Baselines	14
2	Document and Information Types	15
2.1	Hardware and Software Documentation.....	15
2.2	Document (Drawing) List	15
2.3	Procurement Documentation	16
2.4	Source Control Document / Vendor Item Drawing	16
2.5	Specifications.....	16
2.6	Hardware Parts Lists and Bills of Material.....	16
2.7	Hardware Assembly Drawings	16
2.8	Hardware Assembly Procedures	16
2.9	Hardware Configuration Database	17
2.10	Software Configuration Database.....	17
2.11	Program Management Support Information	17
2.11.1	Work Breakdown Structure.....	18

Configuration Management Plan

3	Document Management	18
3.1	Document Style and Format	18
3.2	Document Change Control	18
3.3	Change Request Process and Numbering Convention.....	18
3.4	Document Terms / Information Fields	18
3.4.1	Controlled Document	18
3.4.2	Draft (preliminary) Documents.....	19
3.4.3	Released Documents	19
3.4.4	Approval.....	19
3.4.5	Author	19
3.4.6	Release Date	19
3.4.7	Version Number.....	19
3.4.8	Version Date	19
3.5	Document Management Application, Alfresco	19
3.5.1	General Overview	19
3.5.2	OOI Configuration.....	20
3.5.3	Attributes in Microsoft Excel and Word Documents	22
4	Collaboration Applications.....	23
4.1	Overview.....	23
4.2	Confluence.....	23
4.2.1	OOI Configuration.....	23
4.3	Redmine	24
4.4	Git	27
4.4.1	CI Software Repositories	27
4.4.1.1	Repository Tagging.....	27
4.4.1.2	External Dependencies of the CI Software.....	28
4.4.1.3	Backup Policy for OOI CI Repositories.....	28
4.4.1.4	Backup Recovery Testing.....	28
4.5	Ansible	28
4.6	Gerrit.....	28
4.7	Jenkins.....	29
4.8	Program Management Portal (SAF)	29
5	Design Reviews.....	29
6	Configuration Control Structure.....	29
6.1	Baselines	29
6.2	Engineering Change Classes	29
6.2.1	Class I Changes	29
6.2.2	Class II Changes	30

Configuration Management Plan

6.2.3	Administrative Changes.....	30
6.2.4	Engineering Change Content	30
6.3	PMO / IO Change Control Boards	31
6.4	System Level Change Control Board	32
6.5	NSF Program Manager Review.....	32
7	Change Control Process	33
7.1	Requests for Engineering Changes.....	33
7.1.1	Assessing the Impact of Requested Changes.....	33
7.1.2	Change Control Documentation	33
7.1.3	Budget for Changes.....	33
7.2	Change Control Board Operation	33
7.2.1	Records of Meetings.....	34
7.2.2	Timing of Meetings	34
7.2.3	Submitting and Scheduling of ECRs	34
7.3	Change Control Board Authority.....	34
7.3.1	PMO / IO CCBs	34
7.3.2	System Level Change Control Board	34
7.4	Review Authority.....	35
7.5	ECR Closeout.....	35
	Appendix I – CI Pre-Commissioning SW Repositories.....	36
	Appendix II – External Dependencies of SW Repository Code	38
	Appendix III – Repository Backup and Recovery	39
	Repository Backup	39
	Repository Recovery.....	39
	Appendix IV – Repository Recovery Test Plan	40

Configuration Management Plan

1 Configuration Management System Structure

1.1 Purpose

The Configuration Management Plan (CMP) establishes the activities, responsibilities, processes, and methods used to document and maintain the design of the Ocean Observatories Initiative (OOI) program and to manage changes to the design and scope of the system of systems.

1.2 Scope

The CMP is applicable to all OOI systems and subsystems hardware and software technical data, designs and software code and hardware developed or delivered as part of the OOI program. The OOI "Program" now includes all of the National Science Foundation (NSF) funded resources and materials to be addressed as part of the Operations & Management (O&M) agreements with the Woods Hole Oceanographic Institution and sub-awardees.

The CMP defines the roles, responsibilities, and authorities of the OOI team members in the configuration management of the OOI Operations and Management (O&M) phase.

1.3 Configuration Process

The OOI Program Management Office (PMO) and Implementing Organizations (IOs) shall have the following standards and processes in place and follow the standards and processes in the performance of the contract:

- a) Drawing Standard / Software Coding Standards
- b) Software Versioning and Configuration Process
- c) PMO / IO Documentation Assurance Process
- d) PMO / IO Configuration Management Process

1.3.1 Drawing Standard

The IOs have the option of utilizing their own drawing standards if it is similar to or exceeds the American Society of Mechanical Engineers (ASME) Y14.100 (Engineering Drawing Practices) requirements, otherwise ASME Y14.100 shall be used as the drawing standard. The standard must provide engineering definition to assure the functional interchangeability of parts when procured from original or alternate sources.

1.3.2 Software Versioning and Configuration Process

The IOs have configuration management processes in place to manage software versioning and configuration. The IO systems have been appropriately tailored to reflect the nature of the software efforts they manage.

The Cyberinfrastructure (CI) uses GitHub and Git Version Control Systems, with internal organization appropriate to efficient collaboration and management of the software.

The Coastal Global Scale Nodes (CGSN) and Regional Cabled Array (RCA) use GitHub and Git as their source code repositories to maintain version control and allow collaborative development. For RCA platforms, version control applies to all Platform Controller software modules and all firmware running in microcontrollers on CGSN-designed processor elements. In addition, distribution files, installation scripts, and release notes are version controlled.

Configuration Management Plan

CGSN uses Vault as their source code repository to maintain version control and allow collaborative development. For CGSN platforms, version control applies to all Platform Controller software modules and all firmware running in microcontrollers on CGSN-designed processor elements. In addition, distribution files, installation scripts, and release notes are version controlled.

1.3.3 Implementing Organization Documentation Assurance Process

The IOs shall have a process in place that assures that the Technical Data Package delivered has undergone a thorough and structured creation, check, and approval cycle. Changes to the contents of the TDP go through IO and/or System Level CCB as appropriate and as described in the rest of this document.

1.3.4 Implementing Organization Configuration Management Process

The IOs have a Configuration Management Process in place that describes the IO's configuration control processes, a Configuration Manager (CM), and an IO Change Control Board (CCB) process compliant with OOI policies and procedures.

The Coastal Global Scale Nodes (CGSN) IO's Configuration Management Plan (Document Control Number [DCN] 3101-00047) is incorporated by reference. The CGSN Configuration Management Plan supports the OOI CMP's goals and defines the roles, responsibilities and authorities of the CGSN team members in the configuration management process. The CG CMP establishes the activities, processes, and methods used to document and maintain the design of the CGSN, which includes but is not limited to infrastructure elements such as: moorings, surface buoys, autonomous underwater vehicles, multifunction nodes, platform controllers, power systems, profilers, gliders, telemetry, operations and management center, and instrument packages.

The Regional Cabled Array (RCA) IO (formerly known as the Regional Scale Nodes [RSN] codifies its configuration management approach in its Project Execution Plan (DNC 4021-00001, Section 2.2.1). The Cabled Array has established processes and procedures for the hardware and software requirements, versions, documents, and drawings. This process includes a formal change control board to process Engineering Change Proposals through a structured review process. Changes addressed include any new sensors, secondary, primary equipment, or software prior to implementation and ensures that adequate pre-implementation testing has been completed and that a detailed Method of Procedure for the change is in place, inclusive of recovery or fall-back procedures. All changes are implemented and approved in strict accordance with the OOI CMP. All approved changes will be incorporated into the appropriate document(s) and will be reflected in the system inventory database by the Cabled Array Systems Engineer.

Rutgers IO has defined the CI Software Configuration Management section to establish processes and procedures for the CI software. These processes include the transition of the CI software to a set of repositories residing at Rutgers. It includes establishing software configuration management tools and processes, and formal backup and recovery procedures for the CI software.

1.4 Responsibility & Authority

The responsibilities and authority of the members of the OOI project teams are defined by the cooperative agreement between the National Science Foundation (NSF) and the Woods Hole Oceanographic Institution (WHOI), and the subaward contracts between WHOI and the IOs. The roles of the Configuration Management Process leadership members are outlined below.

NSF Program Director: The NSF Program Director is the program sponsor and has the sole authority to revise any program baselines. Program Baselines are defined as: the milestone point-in-time scope and "state" of the related programmatic metrics. Specifically, at the NSF level, these are the program technical scope, cost and schedule.

Configuration Management Plan

OOI Program Principal Investigator: The OOI Program Principal Investigator (PI) has the authority and responsibility to carry out the policies and activities described herein, and may delegate such authority as required.

OOI Senior Project Manager: The OOI Senior Project Manager (SPM) at the PMO has primary responsibility for all system of system and system level issues. The OOI SPM will work with the OOI Program Engineer to implement the Configuration Management Process as described herein across the OOI to ensure that requirements, designs and interfaces are fully defined, documented and maintained.

OOI Program Engineer: The OOI Program Engineer is the OOI Configuration Manager, and has primary responsibility for all OOI system of system and system level issues. The OOI Program Engineer is responsible for implementation of the Configuration Management Process as described

IO Project Managers: The IO Project Managers (PMs) have primary responsibility for all system of system and system level issues within their IOs. The IO PMs will work with their IO Principal Investigators, Chief/Lead System Engineers and IO Configuration Managers to implement the Configuration Management Process as described herein across the collaboration to ensure that designs, requirements and interfaces are fully defined, documented and maintained.

OOI and IO Configuration Managers: The OOI and IO Configuration Managers manage the CCB process, assure changes are completed correctly, and supervise distribution (posting) of new revisions and the recall of obsolete documents. The OOI Program Engineer serves as the Configuration Manager, reporting to the OOI Senior Project Manager or delegate. Each IO PM shall assign the duties of configuration management to a member of the IO project office.

Configuration Management Plan

1.5 Configuration Controlled Documents

Documents and records will be maintained as described in this plan, including the following key products:

:

- Science Prospectus and Traceability Matrix
- Science Requirements
- Final Network Design
- Technical Data Packages (TDP) – including by not limited to:
 - o Engineering Requirements Documents
 - o Interface Agreement/Control Documents
 - o Engineering Design Documents (e.g., drawings, specifications)
 - o Test Plans and Procedures
- Network Design (documents and drawings)
- Program Plans and Policies (e.g., System Engineering Management Plan Final, Cost Estimating Plan)
- Work Breakdown Structure (WBS) and related support documents
- Cost Books

1.6 File Formats and Applications

The following shall be used to create and exchange information between IOs and the OOI PMO and in preparation of any technical data package.

Type	File Format /Application
Requirements Database	Excel Spreadsheets
Document Authoring	Word 2010
Document Distribution	Portable Document Format (PDF)
Engineering Drawings	Inventor 2018 and AutoCAD Electrical 2018.
General Graphics	Note: vector form
Network or Diagram Graphics	Enterprise Architect (Visio Omni / Graffle optional)
Scheduling and Project Management	MSPProject Project 2010
Technical Data Distribution	Excel 2010
Collaborative Application	Description
Confluence	Web collaborative environment / Wiki
Alfresco	Document Management System
Redmine	Action Item / Issue Tracking
GIT and GitHub	Software Code CM
Program Management Portal (SAF)	Change Control, Risk/Opportunity Management, Instrument Application

Note: See [Collaborative Applications Section 4](#) for details.

Configuration Management Plan

1.7 File Naming Conventions (Non-Controlled)

The following naming convention shall be used to exchange information between IOs and the OOI PMO and in preparation of any technical data package of non-controlled documents/drawings.

This naming convention is also used for documents prior to their submittal to the Document Management System (DMS), prior to the issuance of a control number, or for controlled documents during the revision process.

File Name: <Short Descriptive Name>_<Scope Level>_YYYY-MM-DD_ver_#-##.ext

Short Descriptive Name: relative to the subject or name of the document

Scope Level: identifying the scope of the document, from a sensor, platform, location, observatory, or top level, (e.g.: OOI, Irminger, RCA)

Date: in four digit year, dash, two digit month, dash, two digit day, representing the completion date, release date, or current version of the document, incremented as changes are made. The date displayed in the file name should be the date of the last change.

Version: "ver" indicating the major release number followed by the minor working level, number dash number. A required element if a released version of a configuration controlled document. Used for version tracking in non-configuration controlled documents. (e.g.: ver_0-00 for the first version or ver_2-05 for a later version designating the second major revision and fifth minor working level revision following the last major change) Use a leading zero for "dash" 0 through "dash" 9 (e.g. -00, -01, -02,...-09)

Note: Underscores are used as separators, no spaces permitted in file names. Dashes are to be used only for the date string and version number string. For example:

- *CMP_OOI_2008-01-21_ver_2-05.doc* [*Configuration Management Plan*]
- *Preliminary_Design_Document_CI_2007-07-24_ver_3-01.doc*

1.7.1 Terms and Definitions

The OOI Program Terms and Definitions list is maintained by the OOI Systems Engineering (SE) group.

1.8 File Numbering Conventions (Controlled)

All controlled and released level documents shall have a unique OOI / IO document number assigned and added as a prefix to the document file name.

The document number shall be comprised of a four digit Series Number and a five digit Sequence Number. The document number shall follow the following format (##### - #####).

The OOI and IO level configuration managers shall assign and track the requests and issuance of the document numbers. The OOI Configuration Manager has primary responsibility for all system level configuration issues. The OOI Configuration Manager shall disperse and assign file series and sequence numbers from the system level. The IOs shall implement a system-level umbrella file number/naming convention to append to the OOI / IO series, specific to the requirements of the IO configuration management process for controlled documents and drawings. The IO Configuration Manager/SE shall assign from within the series identified for each IO.

1.8.1 Series Number

The file Series Numbering convention shall follow the integrated Work Breakdown Structure (WBS), with Series Numbers corresponding to the second level of the WBS.

Configuration Management Plan	
Series Number	Assignment
1000	System Level
2000	Cyberinfrastructure
3000	Coastal Global
4000	Regional
5000	Operations and Maintenance
6000	(reserved)
7000	Education and Public Engagement
8000	Endurance Array
OOI Program Level	
1000 – 1099	OOI Programmatic Documents
1100 – 1199	OOI Systems Engineering Documents
1131	CI-RCA Interface Control Documents (ICD)
1132	CI-CGSN ICDs
1133	CG-RCA ICDs
1134	CI-EPE ICDs
114n	Technical Review Reports (n=IO specific)
1152	CI Acceptance, Commissioning, Validation Documents
1153	CGSN Acceptance, Commissioning, Validation Documents
1154	RCA Acceptance, Commissioning, Validation Documents
1157	EPE Acceptance, Commissioning, Validation Documents
1158	EA Acceptance, Commissioning, Validation Documents
1161	CI-RCA Test Plans and Procedures
1162	CI-CGSN Test Plans and Procedures
1163	CG-RCA Test Plans and Procedures
1164	CI-EPE Test Plans and Procedures
1200 – 1299	OOI Installation Documents
1300 – 1309	Engineering Change Requests
1330 – 1339	OOI Specifications
1340 – 1349	Data Product documentation
Drawings	
1400 - 1499	OOI Procurements/Acquisitions
1500 – 1599	OOI Programmatic Drawings
1600 – 1699	OOI Systems Engineering Drawings
1700 – 1799	OOI Installation Drawings

1.8.2 Sequence Number

The file Sequence Numbering convention shall be determined by the Configuration Managers for the Series Numbers under their respective control. Different Sequence Number conventions may be used for different types of documents.

Configuration Management Plan

1.8.3 Control Assignment Validation Criteria

The Document Management System (DMS) "Alfresco" assigns a sequential "revision" number to the document when it is loaded and each time the document is changed. This "revision" number is not recorded in or on the file or document.

The CM must ensure that the "Version" number assigned and tracked for OOI controlled files is included on the cover and in the document control sheet of each file, prior to assigning a control number. The "Version" number must be recorded in the DMS in the description field along with the date the document was approved by CCB. If the document was approved with liens, the date and version must be updated when the liens are resolved.

1.8.4 Controlled Files Outside of the DMS

Checking-out, downloading, exporting or off-line editing of a controlled document outside of the DMS requires that the file name be appended with the versioning convention described in Section 1.7. The OOI Version Number should be appended to the file name. In all cases the DMS document is the document of record, and the Configuration Manager will manage all updates from external sources.

1.9 Other Naming Conventions

The OOI Program and IOs will develop multiple naming and alpha-numeric identification and tracking conventions. The conventions will be maintained by the IO SE and OOI Program Engineer and maintained in the B2 Table, DCN 1001-00001.

1.9.1 Observatory - Instrument Name

The Configuration Item naming convention maintained in the B2 Table DCN1000-00001 is used to uniquely identify components in the system at the instrument level. This convention will be used to identify items such as Control Centers, Moorings, Buoys, Nodes, Cables, Instruments and Sensors in a consistent manner across all documentation and databases. Accurate and consistent identification of components is required for effective fault management, auto-discovery, performance reporting, sensor data storage, etc. The identification of the instrument and accurate correlation between an item identifier and all databases that contain supporting information is supported by the Instrument ID naming convention.

An OOI Node is defined as an entity that aggregates or logs data from multiple instruments or distributes power, time, and communications. An OOI Instrument is defined as a collection of sensors, data samplers, data loggers and sensor controllers, with a known internal structure/geometry.

1.10 Technical Data Baselines

The Technical Data Package (TDP) is the complete documented set of technical information, data, software, and drawings that completely describe the system to the level necessary to manufacture, implement, test, and maintain the system. TDP Contents are defined in Systems Engineering Master Plan Final DCN 1000-xxxx.

If incomplete during OOI 1.0, the IOs shall prepare and provide the following baselines of the TDP during OOI 2.0:

- a) **Design Baseline:** The design baseline shall be established after the design has been completed; all drawings and their associated parts lists and wire lists have been created including all changes via the ECR process during the development of the item. This baseline shall document the design of a Tracked Design Item as provided at the Critical Design Review (CDR) for that item.

Configuration Management Plan

- b) **Production Baseline:** The production baseline shall be established after the design has been completed and updated; all drawings and their associated parts lists and wire lists have been developed and or updated including all changes via the ECR process and corrections of discrepancies discovered during the initial production and verification testing of the item. This TDP shall represent the system to be produced in quantities. This baseline shall document the design of a Tracked Design Item (TDI) as provided at the Production Readiness Review (PRR) for that item. In the case of TDIs that do not hold a PRR, the Design Baseline will suffice until the As-Built Baseline can be established.
- c) **As-Built Baseline:** The As-Built baseline shall be established after the item has been produced and deployed; all drawings and their associated parts lists and wire lists have been developed and or updated including all changes via the ECR process and corrections of discrepancies discovered during the production, deployment, and verification testing of the item. The As-Built TDP shall represent the installed system, including any deployment location specific information.

2 Document and Information Types

2.1 Hardware and Software Documentation

Documentation generated for the purposes of defining the design, manufacture, installation and service of OOI hardware shall be created, approved and changed per the processes noted in this document and the *OOI System Engineering Management Plan Final*

Hardware documentation can include:

- Requirements
- Specifications
- Engineering Analysis and Decision Reports
- Assembly procedures
- Assembly drawings and schematics
- Bill of Materials and parts lists
- Test plans, procedures, and reports
- Installation and commissioning procedures and forms

Documentation generated for the purposes of describing the functionality, interfaces and use of software shall be created, approved and changed per the processes noted in this document and the *OOI System Engineering Management Plan Final*

Software documentation can include (in addition to items listed above):

- Use cases
- Interface and Usability Design Documentation (including wireframes)
- Source Code, for all iterations
- Build environment lists and procedures
- Software Requirements Documentation
- Software Architecture Documentation (including any UML-related material available)
- System Logical and Physical Architecture Diagrams
- Data diagrams and documentation (data schemas, data flow diagrams, entity relationship diagrams, etc.)
- Administrator and User Manuals
- Maintenance Processes and Procedures

2.2 Document (Drawing) List

Each Configuration Manager will assist in maintenance of the document list, and will use it in assigning new document control numbers.

Configuration Management Plan

2.3 Procurement Documentation

Procurement documents are those documents utilized in bid and proposal activities, which include buyer's invitation for bid, invitation for negotiations, request for information, request for quotation, request for proposal and seller's responses, specifications, statements of work, and requirements. These documents are created by the engineering development effort and become part of a documented baseline with sufficient information for the purchase or manufacture of needed items. The complexity of the documentation may range from a vendor's part number and corresponding specification sheet to a detailed specification and performance criteria to achieve reasonable confidence that a competitive selection will yield the expected technical/programmatic result. When appropriate, procurement documentation (such as Request for Proposals) are stored in the Controlled section of the OOI DMS – Alfresco.

2.4 Source Control Document / Vendor Item Drawing

Source Control Documents (SCD) may be used to describe qualification and acceptance requirements for procured items.

2.5 Specifications

A specification provides details about the specific requirements. The specification establishes the complete set of detailed characteristics of the item to be delivered, and is typically much more comprehensive than an SCD. OOI specifications are controlled documents and are stored in the Controlled section of the OOI DMS, Alfresco.

2.6 Hardware Parts Lists and Bills of Material

Each hardware assembly drawing shall be accompanied with a Parts List that describes all of the materials and components that are required to build an assembly or subassembly, including quantity, part/model # (as appropriate) and part version (as appropriate). The Parts List may be a stand-alone document or included as part of the assembly drawing.

Each system shall be accompanied by a Bill of Material (BOM) that is hierarchical,. The BOM includes, as available: part/model number, quantity, procurement type, initial supplier and historical contract or PO #.

2.7 Hardware Assembly Drawings

Assembly drawings shall be developed for each module, top-level hardware assembly or subassembly that is to be manufactured or delivered for OOI. Assembly drawings include the version of the assembly or subassembly they represent. The document number and revision of the assembly drawing may be used as the part number and revision of the assembly or subassembly it represents. An extension may be added to the base document number to indicate that multiple configurations of the item exist. All released drawings shall include the OOI logo and/or "Ocean Observatories Initiative" in the title block.

2.8 Hardware Assembly Procedures

Each hardware assembly drawing may be accompanied with an Assembly Procedure or Assembly Instructions that describe all of steps and tools required to build an assembly or subassembly. The Assembly Procedure may be a stand-alone document or included as part of the assembly drawing.

Configuration Management Plan

2.9 Hardware Configuration Database

The OOI PMO shall establish a TDP Repository in the DMS that maintains the "as built" configuration of OOI devices / hardware including, software, and firmware installed. Each IO shall support the operation of the database by providing data directly or indirectly to the database application or the OOI PMO.

The database contains the following information:

- Part number, serial number, and revision of the final hardware assembly
- Part number, serial number, and revision of all hardware subassemblies integrated into a hardware assembly
- Part number and serial number of major components integrated into a hardware assembly
- Firmware
- Software version and configuration
- Installed firmware version installed
- Date of manufacture
- Installation Details

2.10 Software Configuration Database

Each IO shall establish a database that maintains the "release" configuration of OOI software and firmware. Each IO must support the operation of the database by providing data directly or indirectly to the database application or the OOI PMO.

The database will need to contain the following information, such as:

- Version number of the software build/release, including any integrated applications, modules or libraries
- Software installation instructions
- Software version description
- Build instructions including build environment

2.11 Program Management Support Information

The OOI PMO maintains a set of information including but not limited to the following:

- Processes
- Procedures
- Training materials
- Manuals
- Assembly and test records
- Acceptance
- Plans
- Budgets
- Costbooks and Basis of Estimates
- Risk and Opportunity Register
- IO Schedules and Integrated Master Schedule

The documentation is generated for the purposes of supporting the management of the OOI including management of the work of defining the design, manufacture, installation and service of OOI. The information shall be created, approved and changed per the processes noted in this document and the the *OOI Systems Engineering Management Plan Final 1100-000004* .

The program management support information will be developed and archived in software applications and databases, such as SAF and Alfresco. Each IO shall provide data directly or through

Configuration Management Plan

the OOI PMO. Program management activities must be monitored and reported on at periodic intervals as defined by the Cooperative Agreement with NSF and as directed by the OOI PMO.

2.11.1 Work Breakdown Structure

The OOI WBS and WBS Dictionary establish the individual elements of work that will be managed. The WBS is a controlled and maintained set of data.

3 Document Management

The OOI Configuration Manager is responsible for tracking and maintenance of the artifact list (in SAF) with version numbers and dates. IO Configuration Managers and/or authors of preliminary documents are responsible for providing updates, including newly assigned Document Control Numbers, to the document management administrators for the Program Management Portal (SAF).

3.1 Document Style and Format

The Configuration Management Plan is the template for document style and format. All documents must contain a title page, change control tracking page and a table of contents. Each page is to be numbered and include the document name and version number.

3.2 Document Change Control

Preliminary documents may be changed by the originator and distributed as needed. Updates must be listed in the Document Control Sheet, including date, version, change description, and originator. Controlled documents may be changed only via an Engineering Change Request (ECR).

3.3 Change Request Process and Numbering Convention

An ECR shall be completed by the requestor of the change or a member of the Change Control Board. The person requesting the change shall do so via the Change Control tool in the Program Management Portal (SAF). The Change Control tool automatically assigns an appropriate document number to the ECR. ECR numbering shall adhere to the following format:

130x-nnnnn

where:

x is the PMO/IO 2nd level WBS series number (e.g., System Level 0, PMO 1, CI 2, CGSN 3, RCA 4, EA 8)

nnnnn is the unique ECR number serially assigned by the automated system.

Note: The Engineering Change Request process is managed by the OOI CCB Chairperson or a designated member or Configuration Manager with the delegated authority.

3.4 Document Terms / Information Fields

3.4.1 Controlled Document

Any process or program document that is formally approved, maintained, distributed, and revised via a document control system.

Configuration Management Plan

3.4.2 Draft (preliminary) Documents

Preliminary documents have a title and version number, include the word "Draft," an identified originator, and the date of the current preliminary version clearly shown both on the document and in the document list.

3.4.3 Released Documents

When a document has been reviewed and approved by the appropriate level Program/Project Manager and Change Control Board, it is entered in the Document Management System (Alfresco), considered released and is subject to formal distribution and revision control. Released documents will NOT have qualified titles such as "Draft " and the date and version information will be removed from the file name. Some types of documents may be assigned a document control number, approved via appropriate sign-off, and released to Configuration Management without going through the CCB process. Examples include test reports, specifications, contracts, and requests for proposals. The appropriate level of sign-off is determined by the Configuration Manager at the IO Level and OOI Program Engineer at the System Level.

3.4.4 Approval

The CCB process by which a document is reviewed and determined to be suitable for use by designated staff and management. Levels of approval exist at the IOs and OOI PMO, and are by default the Project Manager at the IO level and the Sr. Program Manager at the OOI PMO level.

3.4.5 Author

The person or entity that creates the document; typically used for text documents. Interchangeable with Originator.

3.4.6 Release Date

This is the date of the original release of the document defined as the date of the document was formally approved. If the document was approved with liens, the date and version must be updated when the liens are resolved. Preliminary documents have no release date. This date is recorded internal to the document, and is not represented by the file naming convention date.

3.4.7 Version Number

The latest version of a document is defined by the version date in the document file name and a numeric version number. It indicates the major release number and the minor update level using the convention of a number dash number (e.g., ver_2-05). By contrast, drawings use REV letters.

3.4.8 Version Date

The date of the current version (either draft, approved or in update), as YYYY-MM-DD. It must be updated each time the document is changed. At the time of release, this date remains the date the document was last updated prior to release. The date is removed from the file name upon entry into the DMS or control.

3.5 Document Management Application, Alfresco

3.5.1 General Overview

The Alfresco Document Management software is the basis for the OOI Document Management System (DMS) portion of the Collaboration Tools.

The central repository of the OOI DMS stores libraries of released documentation, as well as past revisions and versions. This central repository allows for disparate groups and individuals to gain access to the proper documentation, and provides an easy to use, single source of access to all of the documentation they require. It enables policies that apply to the documents within the repository, including organizational security, disaster recovery, retention, and archive policies.

Configuration Management Plan

Alfresco uses roles to determine what a user can and cannot do in a space. These roles are associated with permissions set for each specific space, while Administrators have all rights in all spaces; proper authority is required to create, edit, or delete content and information.

3.5.2 OOI Configuration

The OOI Alfresco Document Management System (DMS) is hosted and maintained by the network administrators at WHOI.

3.5.2.1 Roles and Permissions

The following table shows the modified roles and permissions for the OOI Alfresco DMS:

All permissions apply to the invited space	Collaborator	Contributor	Editor	Consumer (4)
See invited space	X	X		X
View content	X	X		X
Copy content	X	X		X
Preview content in template	X	X		X
View content properties	X	X		X
Check in content to invited space	X			
Checkout content to different space.	X			
Update/edit content created by other users	X			
Update properties for content created by other users	X			
Edit existing discussions	X			
Create/add new content (1)	X	X	X	
Cut/delete content created by other users				
Create child spaces in the invited space	X	X		
View content rules	X	X		
Checkout content to same space.	X			
Contribute to existing discussions	X	X		
Invite others				
Start new discussion topic	X	X		
Delete content created by other users				
Same access rights as content owner				

Configuration Management Plan

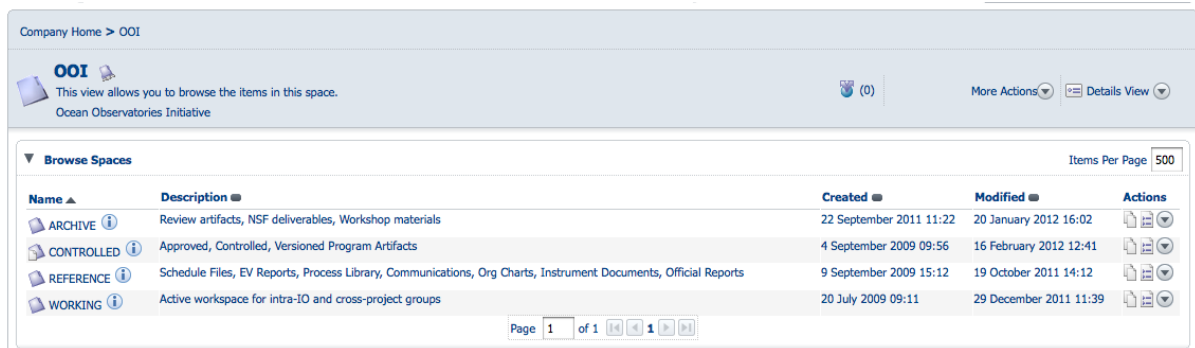
Take ownership of content

Create space rules

Configuration Management Plan

3.5.2.2 Directory Structure

When entering the OOI DMS, users are presented with the top level OOI portal view of the system. Here is where the File System layout of the OOI DMS will be found, which includes these base directories:



Directories available to each user are based on permissions. Within each directory, users will find all managed documentation associated with that directory, reference the control Alfresco structure document 2100-60002. Each document will display attributes such as its name, the date/time stamp of its latest revision, size of file, as well as display icons which represent what functions are available to the user based on their roles and permissions (e.g., Edit Offline, Download, View Details, Copy, etc.), located in the right-hand column under "Actions."

3.5.2.3 Version Control

All documents entered into the OOI DMS are subject to version control, as long as versioning for each document is turned on. Documents within the OOI DMS support change process by being associated with their prior versions, and having fully preserved previous versions of the documents available to users and groups with the proper privileges.

3.5.3 Attributes in Microsoft Excel and Word Documents

The document properties are the same in both Excel and Word. The DMS uses the information in the document properties to populate the Alfresco metadata when the document is uploaded. Excel and Word document files have the following fields.

1. **Title:** Enter the title of the document. This is the title that appears on the cover page of the document. It uses spaces, does not use underscores, does not include a date and does not include a version number.
2. **Subject:** Enter an optional expanded description for the document.
3. **Author:** Enter the full last name, comma, space, and first initial of the person that is the author of the document.
4. **Manager:** Enter the full last name, comma, space, and first initial of the person that is responsible for configuration management of the document.
5. **Company:** Enter the acronym for the implementing organization (i.e., OOI, RCA, CG, CI, or EPE)
6. **Date Completed:** Enter the release date for the particular document version.
7. **Document Number:** Enter the nine digit document number in the "nnnn-nnnnn" format following the guidelines of [Section 1.8 of this document](#).

Configuration Management Plan

8. **Version:** A "custom" document property for version (OOIVersion) is available on the last tab. A "revision" field is automatically assigned by Alfresco, starting the first time the file is added to the database, but is not user definable. All Versioning information must be maintained in the document properties, titles, headers, footers, as well as the document control sheet. The template uses document properties and update tools to manage these items.

4 Collaboration Applications

4.1 Overview

Seven (7) Collaboration Tools are used to provide the OOI the ability to digitally centralize the creation, control and distribution of information and assets. This includes, but is not limited to, information management, document management, issues management, software versioning and control, as well as requirements management, all of which fall under the purview of the Collaboration Tools. The DMS is detailed in Section 3.

The OOI CI team uses four (4) main tools to manage the software developed in support of the OOI project. Redmine is used as the main project management and issue tracking system, Gerrit for collaborative code development and change review, Jenkins for continuous integration and build-on-demand functionality, and Git and GitHub as the repository management system.

4.2 Confluence

Atlassian's Confluence Enterprise is the Wiki used by the OOI.

Confluence is organized by "spaces" which section off areas based on user requirements (e.g., by topic, by interest, temporally). Spaces can contain articles, documents, comments, lists, calendars, and any list of digital assets (including Excel files, pictures, etc.) The Confluence platform also provides full web service interfaces (SOAP and XML-RPC) for current and future applications or scripts to remotely update content, manage users, or administer individual spaces.

4.2.1 OOI Configuration

The OOI shall use the Confluence Enterprise Wiki instance in a standard corporate, best practice use of a wiki environment. The OOI Wiki is hosted and maintained by the system administration team at the OOI's IT group at Rutgers, The State University of New Jersey.

"Spaces" have been defined within the OOI Wiki for the sake of hierarchically arranging information based on PMO or specific topic areas. The naming convention for "Spaces" is designated by Group or IO, and then topic area. For example, one "space" has been designated as the "OOI Engineering Space," which denotes that this OOI space belongs to any topic area related to systems engineering efforts. Once you have entered a space, you will not only see the creator of the space, but also the last person who has edited the space, or articles within.

The Configuration Manager is responsible for facilitation of the "Spaces" on the OOI Wiki, as well as the content within each of the "Spaces." Authors of preliminary documents, postings, or digital asset within the OOI Wiki are responsible for updating the information on the OOI Wiki.

The OOI shall adhere to security policies and privileges which will grant certain groups and users additional access and management capabilities. These are intended to give certain groups and users privileges of creating, approving, editing, and/or posting information, while at the same time limited functionality and/or capabilities of others.

Configuration Management Plan

4.3 Redmine

As part of the OOI Collaboration Tool set, Redmine shall be the platform of choice for the OOI Issues Tracking and Management System. This tool enables a central repository of software issues, project time-lines and milestones, and visual representations of project status and achievements.

Issues to be processed and worked through the OOI Issues Tracking and Management System basically follow these steps through the process:

1. An issue is submitted by a scientist, engineer, or test engineer, via a web browser or e-mail submission.
2. The issue management system logs the issue and relocates the issue to a predefined representative's inbox.
3. The representative evaluates the issue and assigns it to an appropriate team member.
4. Work is done on the issue, documented in the system, and closed.
5. The originator is notified that the issue has been resolved.

4.3.1 Redmine Workflow

The OOI project is scheduled within Redmine as a hierarchical collection of Issues which accumulate to deliver capabilities to the program. At the lowest level, issues from the current Target Delivery are selected by or assigned to individual developers. As the developer works on an issue, they record their status as a "percent complete" for that issue. Recording of progress should be done daily. It is optional to record hours spent per issue. When the developer has completed what is required in the issue description, performed appropriate unit testing, completed a peer review, and resolved the peer review comments, the developer changes the Status to Resolved and the % Done to 100% indicating that no further work is required for the issue.

Any Bugs or Enhancements are to be entered in Redmine as New issues. They shall be entered with a Status of "New" and should provide sufficient information in the Issue Description and/or Comments so that the Issue can be adjudicated, scheduled, and assigned for work. The backlog grooming team will assign the priority, category, start/due dates, and target version and review the estimated time. Once reviewed, the Issue will have its status set to Ready for Work.

The following are ground rules for managing the issues:

1. Each issue shall be in the Status of "Ready for Work" when the user begins working it. When a user begins the issue, its Status shall be changed to "In Progress".
2. Percent Complete shall be updated daily for each issue that is in the "In Progress" status.
3. The "Estimated Time" field is an estimate by the backlog grooming team. The estimated time shouldn't be modified by the user as this impacts metrics reporting to leadership. The software or software engineer should be informed if the estimate seems to be incorrect.

4.3.2 Issue Attribute Definitions

TRACKER:

- Feature – A new capability
- Subtask – Lowest level tasks which roll up to a Feature
- Blocker – External dependency that is halting further development (see next section for more details)
- Enhancement – A modification to existing capabilities
- Bug – A software defect found in the code or documentation
- Support – Development environment maintenance actions
- Test – Used by testers to document test events and develop reports

Configuration Management Plan

- Injury - Any injury that is, or may, be an OSHA Recordable injury
- Near-miss - Accidents with the potential to cause injury
- Environmental - Incidents in public areas, or incidents that require a Hazmat response
- CI Hardware - Cyber infrastructure hardware
- Marine Hardware - Marine infrastructure hardware
- Recommendation - Suggested changes or enhancements to the OOI System
- Deployment Change - For any deviation from the approved deployment plan that impacts science data delivery
- Informational - For "Informational" Issues
- Nonconformance - A permanent loss of science data
- Requirement - Required functionality
- Dataset - Science Data originating from an instrument.
- Question - An inquiry originating from the OOI user community via the helpdesk.

STATUS:

- New – Not yet adjudicated/ analyzed or inactive pending resolution of a Blocker issue
- Feedback – Adjudication has occurred and is assigned out for analysis
- Ready for Work – Analysis has been completed (resolution identified, estimate provided)
- In Progress – Issue is actively being worked by the Assignee
- Resolved – Issue has been completed including unit test and is in the project's CM repository
- Closed – Review Board has accepted the Issue Resolution
- Duplicate – Issue is a duplicate of another Issue
- Rejected – Issue has been analyzed and determined not to be worked

PRIORITY:

- Low – Issue is a candidate for a later delivery
- Normal – Issue to be resolved in its scheduled delivery (Default)
- Urgent – Issue should be resolved in an interim delivery ahead of Normal priority issues
- Immediate – Issue should be resolved for an immediate fix to the operational system

4.3.3 Blockers

1. When a Redmine Feature in the current Delivery is blocked by delays in receiving externally-developed code, errors in externally developed code, lack of source data with which to test, lack of information necessary for integration, or lack of SMEs for consultation, it is necessary to create a new issue with the following attributes:

Status = New

Tracker = Blocker (we've added this new Tracker type)

Category = (Algorithm, Asset Manager, GUI, Sensor, Web Services, etc. as appropriate)

Priority = High

Assignee = (identify who, by name, is responsible for delivering the data/information/bug fixes needed to get us working again)

Target Version = Backlog

Related Issues = Blocks Feature #xxxx (where xxxx is the Feature/Capability that is blocked)

Description = (be verbose)

- A. What is the problem

Configuration Management Plan

- B. What does our uFrame CI development team need to get back to work on the Feature that is blocked
- C. What the is exit criteria by which the external entity will be held (what they need to do to "Resolve" the issue)
- D. When we need the external issue resolved (due date)
- E. Impact to the blocked Feature (e.g. Delivery "Y" will not be able to ingest sensor "aaaa" data from array "bbbb")

Parent Task = (either Work Assignment 2, 4, 5, or 6 which will indicate it is associated with SI, AM, DM, or WS)

2. The Redmine Feature in the current delivery that is blocked will be changed to the following:

Status = New (indicating not "Ready-for-work" and not "In Progress")

Tracker = (no change)

Category = (no change)

Priority = (no change)

Assignee = (no change)

Target Version = (no change)

Related Issues = Blocked by #yyyy (where yyyy is the blocker from 1. above)

Description = (no change)

Comment = Impact to the blocked Feature (copied from 1.E. above)

Parent Task = (change to either WA2, 4, 5, or 6 which will remove it from the % Done roll-up on the in the weekly status slides to OL)

3. Reports of all issues where "Tracker = Blocker" will be reviewed and delivered to the integration team for resolution.

4.3.4 List of Current Redmine Projects

- Safety and Environmental
- Hardware
- Operations Management
- Ocean Observatories (Pre-Comm)
 - Algorithms
 - C2 Test Cases
 - Conditional Acceptance
 - Driver Plugins
 - Dataset Parsers
 - Instrument Agent Drivers
 - Platform Drivers
 - OOINet Integration
 - QA Testing and Acceptance
 - Data Evaluation
 - Web Interface Testing
 - uFrame
 - Web Interface
 - Web Interface API testing
- Archive
- Helpdesk

Each of the Projects form a permanent record of the initial incident/issue notification, and the response to it. The record also provides for long-term tracking and trend analysis, particularly for safety incidents and problems. The Safety, Problem, and Recommendation Issues will be regularly

Configuration Management Plan

reviewed by a PMO-IO Review Board. The Board will review Safety Issues, provide final closure of problem Issues, and evaluate Recommendations for potential incorporation into the OOI.

4.3.5 Redmine Helpdesk Plugin Functionality

The Plugin will facilitate all the interactions with External Users. They will be able to create Redmine tickets through the Help Desk via the OOI project web site. The “Trouble Ticket” form on the OOI data portal, creates an issue directly in Redmine or via email which the Redmine system will automatically ingest. The Redmine system will also respond to external users via e-mail about the status of tickets created by the system on their behalf. This eliminates the need for external users to have a Redmine Account or an understanding of the Redmine Tool.

4.4 Git

Git provides the software code repository framework that the above four tools rely upon. Git is where the actual code files are stored. Git provides its own framework for version control that is used by and extended upon by other tools such as Gerrit and Jenkins.

OOI uses Git Version Control Systems, with internal organization appropriate to efficient collaboration and management of the software. The exact organization of these systems is documented in the Confluence pages at: <https://confluence.oceanobservatories.org/display/CIDev/Revision+Control>.

Additional information on Cyberinfrastructure software configuration management practices is contained in the Integration, Test, and Verification Strategy document (DCN 2110-00005).

Git is hosted and maintained by the system administration team at the OOI's IT group at Rutgers, The State University of New Jersey.

4.4.1 CI Software Repositories

The complete list of OOI Pre-Commissioning CI software repositories that will be transitioned to and managed at Rutgers is listed in Appendix I: CI Pre-Commissioning SW Repositories .

A new Git repository server will be set up to consolidate all the repositories: those that reside on uframe-cm.ooi.rutgers.edu and those that currently reside on the GitHub site. These new repositories will become the new “master branch” of the OOI CI software.

After all the repositories have been consolidated onto the local server, the software will be tagged to identify the initial CI software release. The initial tag for the software release will be:

OOINET1.0.0

This release will constitute the baseline software for the OONET system. A backup copy of the baseline will be created after the release has been tagged.

4.4.1.1 Repository Tagging

After creation of the baseline release, it is expected that the software will continue to evolve as new features approved by the CCB are added and problems are identified and fixed. The set of software files that make up a given production release will be identified by creating a tag within each repository of the complete set of repositories. These tags will be constructed according to the following format:

< feature # >.< performance improvement >.<fix(s) # >

Configuration Management Plan

4.4.1.2 External Dependencies of the CI Software

During the construction phase, decisions were made to utilize external third party libraries and services rather than develop the code within the CI project. These dependencies, where possible will be backed up in Git and copies maintained at Rutgers. Appendix II has list of dependencies identified to date.

4.4.1.3 Backup Policy for OOI CI Repositories

The complete set of all OOI CI Git Repositories will be backed up to flat files daily, weekly, monthly and yearly. The retention policy for the collection of backups is defined to be:

Backup Frequency	File Retention
Daily	7 latest
Weekly	8 latest
Monthly	Retained Indefinitely
Yearly	Retained Indefinitely

4.4.1.4 Backup Recovery Testing

Recovering a repository from a backup file will be tested at a minimum of once per year. The Recover Process is defined in Error: Reference source not found. The Recovery Test plan is defined in Appendix III: Recovery Test Plan.

4.5 Ansible

Ansible, a platform that combines multi-node software deployment, ad-hoc task execution, and configuration management, will be used to manage the whole OOI infrastructure. It is a consistent, secure and highly reliable, using OpenSSH as its default transport layer. Ansible uses YAML as a description language. It will be used to keep track of the software installation, build, and deployment instructions. A dedicated server will be set up in order to act as a controlling node for the entire set of OOI Net servers and services.

4.6 Gerrit

Gerrit is a web-based collaborative software development and code review system. This enables distributed development of the OOI software, with easy review of changes and additions. Gerrit works together with Git and Jenkins. Gerrit is hosted and maintained by the system administration team at the OOI's IT group at Rutgers, The State University of New Jersey.

Configuration Management Plan

4.7 Jenkins

Jenkins is an automated build-on-demand or build-on-trigger system for software engineering. Jenkins monitors the status of code bases, and will automatically start a build process when changes are detected. This facilitates the testing and evaluation process, and is a significant enabling technology for better software quality control and assurance. Jenkins is hosted and maintained by the system administration team at the OOI's IT group at Rutgers, The State University of New Jersey.

4.8 Program Management Portal (SAF)

The Program Management Portal (also called SAF) is a Change Control Tool.

5 Design Reviews

The *OOI Systems Engineering Management Plan 1100-00000* is the authoritative source for OOI technical and design reviews.

6 Configuration Control Structure

6.1 Baselines

The IOs and OOI PMO shall facilitate the review, for approval or rejection, of all Engineering Change Requests (ECRs) prior to IO incorporation into the TDP.

6.2 Engineering Change Classes

All proposed changes shall be categorized as Class I or Class II as defined below.

6.2.1 Class I Changes

A change shall be classified Class I when the change is to a controlled design document, controlled policy/plan document, statement of work or contract **and** one or more of the following statements apply:

- a) Affects any physical or functional requirement in approved configuration documentation, (form, fit and function as related to a requirement),
 1. Technical requirements and specifications that affect reliability, maintainability, availability, form, fit, function or interface characteristics
 2. Interchangeability, substitutability, or replace-ability as applied to configuration items and to all subassemblies and parts of repairable configuration items
- b) Affects any approved functional, allocated or product configuration documentation, cost, warranties, or contract milestones,
 1. Cost to the OOI program in excess of \$25,000 per control account, singular and cumulative per control account.
 2. Schedule increase of any duration for any work package on the Critical Path or a direct component of a cross-project dependency,
 3. Schedule to the OOI program in excess of 60 days increase in work package schedule, singular and cumulative per control account.

Configuration Management Plan

- c) Affects approved product configuration documentation **and** one or more of the following:
 - 1. safety, correction of a hazard or conformance to applicable design standards,
 - 2. compatibility, interoperability, interfaces, or logistic support,
 - 3. retrofit of tested or delivered units,
 - 4. interchangeability, substitutability, or replace ability of any item down to non-repairable subassemblies,
 - 5. sources on a source control drawing.
- d) Affects system configuration to the extent that retrofit (replacement of components) action would be taken on a formally tested or commissioned component.
- e) A reallocation of budget between Control Accounts, in excess of \$25,000 or 10% of the Control Account budget, whichever is less.
- f) A request for contingency budget allocation at the System, Control Account or Work Package level of the WBS.

6.2.2 Class II Changes

A change shall be classified Class II when the change is to a controlled design document, controlled policy/plan document, statement of work, or contract **and** not categorized as Class I, such as:

- a) Minor in nature, such that the cost of processing the change request may equal or exceed the cost of performing the work,
- b) Does not exceed any single difference of 10% of the control account baseline budget or \$25,000 between a control account estimate to complete and the baseline budget to complete, whichever is lower,
- c) A reallocation of budget at between or within Work Packages within a given Control Account.

6.2.3 Administrative Changes

A change shall be classified administrative when the change is a correction of typographical errors, dimensions, graphical or pictorial representations that do not infer changes to process or technical approach. Administrative changes do not require an ECR, although the date, version, and change description must be included in the Document Control Sheet.

6.2.4 Engineering Change Content

Each ECR must conform to the following minimum requirements:

- a) Each ECR must be unambiguous, and describe in detail the change in the description of change, purpose, reason, or category. In addition, the actual change must be identified in the field of the ECR by either a pictorial representation of the change, e.g., "Original/Previous" and "Requested/Proposed" scheme or a detailed description of the change.
- b) Identify whether a retro-fit is required. Should a retro-fit be required, the ECR must identify each system and/or subsystem that is affected by the change(s).

Configuration Management Plan

6.3 PMO / IO Change Control Boards

The PMO / IO CCBs will consist of the following persons or functional areas represented, at a minimum, with the chairperson approving additional guests and members. Members may represent multiple functional areas (e.g., the Principal Investigator may also serve as the Science Representative, or a Project Manager may serve as a Budget Representative). Additionally, Quality and Safety shall be represented at the PMO-level by the OOI Program Engineer and at the IO level by the IO Systems Engineer, or their designate.

Chairperson: PMO / IO Program or Systems Engineer
Members: PMO / IO Senior Project Manager / IO Project Managers
PMO / IO Principal Investigator
PMO/IO Finance
Design Cognizant Engineers

The PMO / IO CCB's roles and responsibilities include:

1. Track, review, evaluate and document all requested changes and board actions.
2. Ensure requested change is beneficial to the system.
3. Evaluate alternatives that would achieve the same results.
4. Evaluate all impacts and their effect on scope, cost, and schedule.
5. Approve, reject, or defer requests for change.
6. Document the approved change, and communicate decisions to all stakeholders.
7. Forward all PMO / IO approved Class I ECRs to the System Level CCB for review and approval.
8. Notification of System Level CCB and provision of documentation for all PMO / IO approved Class II ECRs (notification only, not for approval).

Configuration Management Plan

6.4 System Level Change Control Board

The System Level (SL) CCB will convene in person or via technology once per month, or as required by the needs of the program. The OOI Lead SEs shall provide advance notification to the SL CCB Chairperson of any in-process critical ECRs as soon as practicable to ensure prompt scheduling of the session and processing of requests.

The SL CCB will consist of the following persons, at a minimum, with the chairperson authorizing additional participants and members. The Quality Manager and the Safety Manager roles will be supplied by the PMO Program Manager, or designate, and may be a member of the projector institution.

Chairperson: PMO Program Engineer
Members: PMO Principal Investigator
PMO Senior Project Manager
PMO Finance
IO Principal Investigators
IO Project Managers (PMs)
IO Finance
IO Lead Systems Engineers
IO Designated Representative of Project Scientists (PSs)
Design Cognizant Engineers

The System Level CCB's roles and responsibilities include:

1. Track, review, evaluate and document all requested changes and board actions.
2. Ensure requested change is beneficial to the system.
3. Evaluate alternatives that would achieve the same results.
4. Evaluate all impacts and their effect on scope, cost, and schedule.
5. Approve, reject, or defer requests for change.
6. Document the approved change, and communicate decisions to all stakeholders.
7. Track and report the cost and schedule changes to the NSF through standard program systems.
8. Forward to the NSF Program Director any Class I change that:
 - Exceeds the overall program baselines for cost or schedule.
 - Requires reallocation of budget in level 2 of the WBS and corresponding WBS items for the Operations and Management phase) in excess of \$250,000.
 - Exceeds schedule contingency in excess of 45 days.
 - Exceeds the discrete allocation of contingency in excess of \$150,000.

6.5 NSF Program Manager Review

The NSF Program Manager will review for approval any Class I ECRs, which fall under the criteria listed in Section 6.4, No. 8 (above), in person or via technology as required by the needs of the program. The OOI Program Principal Investigator shall provide advance notification to the NSF Program Manager of any in-process critical ECRs as soon as practicable to ensure prompt scheduling of the review and processing of the request.

The NSF PM review will be supported by, at a minimum:

Configuration Management Plan

PMO Principal Investigator
PMO Senior Project Manager
PMO Program Engineer
PMO Finance

(with the NSF PM authorizing additional participants and members as required)

7 Change Control Process

All requested changes must be evaluated for risk and impact on design/capability, schedule, and cost, not only within an IO, but among IOs and within the OOI Program. Changes in the OOI Program are controlled through a formal approval process. The OOI change control process is multi-level with the applicable review/approval level assigned based on the potential impact to the program. The software tool enabling the OOI change control process is maintained in the Program Management Portal (SAF).

7.1 Requests for Engineering Changes

An Engineering Change Request (ECR) is used to identify a recommended change. An ECR includes the following elements:

1. WBS element.
2. Aspect of the WBS element to be changed.
3. Description of the cost, schedule and scope impacts, from the requestor's point of view, of leaving the control account as-is compared to incorporating the suggested change.

7.1.1 Assessing the Impact of Requested Changes

Proposed changes identify impacts from/to:

1. Additional management effort to revise the schedule and notify affected parties.
2. Control account attributes.
3. Control account design documents.
4. Quality of the system.
5. Cost increases of changes at later stages of the project (exponential factor).

In the interest of efficiency, a CCB may process a series of change proposals as a group, depending upon the frequency and importance of the change proposals.

7.1.2 Change Control Documentation

A formal document management system will be used for both the formal processing of proposed changes and their documentation. Each request for change whether ultimately approved or rejected will be documented in the system and thus available to all OOI team members.

7.1.3 Budget for Changes

Budget required for change implementation must be relocated budget within the respective IO's control accounts.

7.2 Change Control Board Operation

Board members that are unable to attend a given CCB session may delegate their authority to a selected delegate/proxy in writing (e-mail). Delegation of representation for quorum purposes must

Configuration Management Plan

be reviewed for approval by the chairperson prior to the session. ECR requestors are required to attend the scheduled CCB session for the ECR, or must appoint a designee and notify the board chair in advance. ECRs without a representative will be deferred at the discretion of the chairperson. Attendance may be through physical attendance, phone, computer, or other electronic means. Other project staff or non-collaboration members may attend the CCB (in addition to the CCB members), with the approval of the chairperson.

7.2.1 Records of Meetings

Minutes of CCB meetings shall be maintained and include (at a minimum):

- Attendees and Delegates
- Change Requests reviewed
- Actions
- Change Request outcomes
 - (additional information requested, approved, denied, closed, etc.)

7.2.2 Timing of Meetings

The CCB shall be held at the chairperson's discretion and the needs of the program. The CCB chairperson has discretion to cancel or postpone a meeting based on mitigating circumstances in the best interest of the program.

7.2.3 Submitting and Scheduling of ECRs

ECRs should be submitted no later than 5 days in advance of the scheduled CCB session to allow sufficient time review, comments, and adjudication. Requests for exceptions to the durations are at the discretion of the CCB chairperson.

7.3 Change Control Board Authority

In conjunction with the Change Class descriptions in Section 6, the CCBs shall operate within the following authority.

7.3.1 PMO / IO CCBs

The PMO / IO CCBs are authorized to manage the configuration of the system within (below) the following thresholds:

Authorized:

- A technical change that does NOT change the scope or scheduling of a deliverable for the project, and does NOT affect an inter-IO interface.
- A reallocation of budget at or below the Work Package Level of the WBS.

The PMO / IO CCB forwards to the System Level CCB any PMO / IO approved/recommended Class I changes and any changes meeting or exceeding the following thresholds:

- A technical change that changes the scope or scheduling of a deliverable for the project, or affects an inter-IO interface.
- A reallocation of budget at or above the Control Account Level of the WBS.

7.3.2 System Level Change Control Board

The System Level CCB will review requests forwarded by the PMO / IO CCBs, and by majority vote either approve or reject the change request, noting any dissenting opinions. The system level review must ensure any potential technical and project management *integration* impacts are evaluated.

Configuration Management Plan

7.4 Review Authority

The table below summarizes the review and approval authority for Class I and II changes at the PMO/IO, System, and NSF level CCBs.

Authority	Class I Change	Class II Change
NSF	Review and Approve Class 1 ECRs which fall under the criteria listed in Section 6.4, No. 10.	Not Reviewed
System Level CCB	Review and Approve All Class 1 ECRs	Review and Approve all Class II ECRs initiated at System Level Notification Only for ECRs initiated at IO Level
PMO / IO CCB	Review and Approve (Individual PMO / IO)	Review and Approve (Individual PMO / IO)

7.5 ECR Closeout

For ECRs that have been Approved or Approved with Liens, the applicable PMO or IO Configuration Manager shall take actions to closeout the ECR in a timely fashion. The owner of the document in question is accountable for completion of any Liens and/or Actions and addressing all integration impacts to related project procedures, processes, documents. Administrative items are generally expected to be completed within two weeks of the CCB. Other items are expected to be completed within four weeks of the CCB. The applicable PMO or IO Configuration Manager shall be accountable for verifying that all Liens and/or Actions and all integration impacts to related project procedures, processes, documents have been fully addressed and then closing the ECR in the Configuration Management tool and for posting the completed document to the Document Management System (Alfresco).

Configuration Management Plan

Appendix I – CI Pre-Commissioning SW Repositories

1. Uframe

- <ssh://uframe-cm.ooi.rutgers.edu:29418/ufcore> (edex)
- <ssh://uframe-cm.ooi.rutgers.edu:29418/ufcore-foss> (edex)
- <ssh://uframe-cm.ooi.rutgers.edu:29418/uframe-ooi> (edex)
- <ssh://uframe-cm.ooi.rutgers.edu:29418/uframe-ooi-foss> (edex)
- ssh://uframe-cm.ooi.rutgers.edu:29418/ingest_engine (ingest engine)
- ssh://uframe-cm.ooi.rutgers.edu:29418/AWIPS2_foss
- <https://github.com/oceanobservatories/preload-database> (edex, stream engine)
- <https://github.com/oceanobservatories/dataset-spring> (edex)
- <https://github.com/oceanobservatories/instrument-agent> (edex)
- <https://github.com/oceanobservatories/agent-web> (edex)
- https://github.com/oceanobservatories/stream_engine (stream engine)
- <https://github.com/ooici/ion-functions> (stream engine)
- <https://github.com/oceanobservatories/pygsw> (stream engine)
- <https://github.com/oceanobservatories/alert-logger> (stream engine, ingest engine)

- <https://github.com/oceanobservatories/mi-instrument>
- <https://github.com/oceanobservatories/mi-dataset> (ingest engine)
- <https://github.com/oceanobservatories/ooi-tools>
- https://github.com/oceanobservatories/ooi_port_agent
- <https://github.com/oceanobservatories/GSW-C>
- https://github.com/oceanobservatories/port_agent
- <https://github.com/oceanobservatories/port-agent-antelope>

2. UI

- <https://github.com/asascience-open/ooi-ui>
- <https://github.com/asascience-open/ooi-ui-services>
- <https://github.com/asascience-open/ooi-ui-alerts>
- <https://github.com/asascience-open/ooi-user-mgmt>

3. OOI-Integration Repositories

- <https://github.com/ooi-integration/uframe-webservices> (uFrame web service scripts)
- <https://github.com/ooi-integration/ingestion-csvs> (calibration and ingestion parameters)
- <https://github.com/ooi-integration/uframe-triage> (uFrame ingestion performance scripts)
- <https://github.com/ooi-integration/qc-lookup> (QC algorithm tables)
- <https://github.com/ooi-integration/python-ingestion> (uFrame data ingestion scripts)
- <https://github.com/ooi-integration/cgsn-parsers> (CGSN data analysis and verification scripts)
- <https://github.com/ooi-integration/asset-management>
- <https://github.com/ooi-integration/get-provenance>
- <https://github.com/adampotocki/ooi-ui-deployment>

4. EPE Repositories

- https://github.com/ooiepe/canvas_ooi
- <https://github.com/ooiepe/deploy>

Configuration Management Plan

- https://github.com/ooiepe/epe_modules
- https://github.com/ooiepe/epe_theme
- <https://github.com/ooiepe/EduVis>
- <https://github.com/ooiepe/tss-php>
- <https://github.com/ooiepe/tss-python>

5. Data Tools

- <https://github.com/kerfoot/uframe-api>
- <https://github.com/kerfoot/ooinet2epe>
- <https://github.com/kerfoot/ooinet-product-browser>
- <https://github.com/kerfoot/uframe-async-requests>
- <https://github.com/najascutellatus/plot-nc-ooi>
- https://github.com/najascutellatus/read_provenance
- <https://github.com/ooi-data-review/ooi-parameters-dict>

Configuration Management Plan

Appendix II – External Dependencies of SW Repository Code

1. **Uframe**
 - a. <https://github.com/oceanobservatories/preload-database>
 - i. **CLOUD Service: gdata.spreadsheet.service** (preload spreadsheet)
 - b. <https://github.com/oceanobservatories/dataset-spring>
 - i. **CLOUD Service: gdata.spreadsheet.service** (Dataset Driver Mapping spreadsheet)
2. **UI**
 - a. **CLOUD Service: Google Analytics**
 - b. <https://github.com/asascience-open/ooi-ui>
 - i. <https://github.com/asascience-open/ooi-ui/blob/master/requirements.txt>
 - ii. <https://github.com/asascience-open/ooi-ui/blob/master/bower.json>
 - iii. [Node Package Manager](#)
 - iv. [uWSGI](#)
 - v. [Nginx](#)
 - c. <https://github.com/asascience-open/ooi-ui-services>
 - i. <https://github.com/asascience-open/ooi-ui-services/blob/master/ooiservices/requirements/dev.txt>
 - ii. <https://github.com/asascience-open/ooi-ui-services/blob/master/ooiservices/requirements/common.txt>
 - d. <https://github.com/asascience-open/ooi-ui-alerts>
 - i. <http://www.postgresql.org/>
3. **OOI-Integration Repositories**
 - a. <https://github.com/ooi-integration/uframe-webservices>
 - i. **Python 2.7**
 - ii. https://github.com/ooi-integration/uframe-webservices/blob/master/pip_requirements.txt
 - b. <https://github.com/ooi-integration/uframe-triage>
 - i. Python 2.7
 - ii. <https://github.com/ooi-integration/uframe-triage/blob/master/requirements.txt>
 - c. <https://github.com/ooi-integration/python-ingestion>
 - i. Python 2.7
 - ii. <https://github.com/ooi-integration/python-ingestion/blob/master/requirements.txt>
4. <https://github.com/ooi-integration/cgsn-parsers>
 - i. Python 2.7.9
 - ii. numpy >= 1.9.2
 - iii. scipy >= 0.15.1
 - iv. matplotlib >= 1.4.3
 - v. bunch >= 1.0.1
 - vi. argparse >= 1.3.0

Configuration Management Plan

Appendix III – Repository Backup and Recovery

Repository Backup

The repository backup is straightforward. For each software repository maintained at Rutgers a backup file of the entire repository is created using Git commands. The file created is then verified via another standard Git command. The daily, weekly, monthly and yearly backups will be taken and the copies maintained via an automated script.

Repository Recovery

Recovering a repository is also a straightforward process using appropriate Git commands. First an empty repository is created using the Git init command. Then the backup file is used to restore the contents of the repository using standard Git commands.

Configuration Management Plan

Appendix IV – Repository Recovery Test Plan

A complete Recovery Test is defined as follows:

- I. For each CI SW Repository:
 - A. Modify the repository and commit the changes:
 1. Select a test file to modify from the repository and save a copy to a separate directory.
 2. Modify the selected file.
 3. Select another test file to delete from the repository and save a copy to a separate directory.
 4. Delete the selected file.
 5. Add a new test file to the repository
 6. Commit all the changes to the repository.
 - B. Select a backup file to recover the repository from.
 - C. Select a new directory to recreate the repository.
 - D. Initialize the repository and restore it from the selected backup file.
 - E. Compare the saved test file copies to those in the restored repository:
 1. For the test file that was modified, check to insure that the saved file and the newly restored file are different and that the restored file does NOT contain the modification.
 2. For the deleted file, check to insure that the file is again present in the newly restored repository and is identical to the copy that was saved at the beginning of the test.
 3. For the added file, check to insure that the file is NOT present in the newly restored repository.
 - F. Record the results for each repository.
- II. Record the date the test was run.