# Homework Day 2

OOI Preliminary Design Review
December 4-7, 2007
Arlington, VA

Project Team

OCEAN OBSERVATORIES INITIATIVE

# Question 1:
# Change Control Process

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| OOI Change Control Process | | Class I ECR | | Class II ECR |
|---|---|---|---|---|
| | | Form, Fit, and Function, Safety<br>Cost or Schedule to the OOI program in excess of $25,000 cost per control account or in excess of 1 week increase in work package schedule, singular and cumulative for both cost and schedule<br>Technical requirements and specifications that affect reliability, maintainability, availability, form, fit, function or interface characteristics<br>Configuration to the extent that retrofit (replacement of components) action would be taken<br>Interchangeability, substitutability, or replaceability as applied to configuration items and to all subassemblies and parts of repairable configuration items | | Minor in nature, such that the cost of processing the change request may equal or exceed the cost of performing the work. Do not exceed any single difference of 10% of the control account baseline budget or $25,000 between a control account estimate to complete versus the baseline budget to complete, whichever is lower. Task level, under the management of a CAM. Correction of typographical errors, dimensions, graphical or pictorial representation. |
| **Board Level** | **Board Membership** | **Level I Authority** | | **Level II Authority** |
| IO | **Chair – IO SE**<br>IO PI<br>IO PM<br>Design Engineers<br>CAMs | Generate, review and approval all IO internally generated ECRs. Non-Critical Path up to one month. Funding at WP level. No contingency. | | Generate, review and approval all IO internally generated ECRs. Non-Critical Path up to one month. Funding at Workpackage level. No contingency. |
| | | Forward all Level I ECRs to System Level CCBs that change scope of work, interface or a deliverable. Changes that exceed one month in schedule impact and any on the Critical Path. Funding at a Control Account Level. | ↓ | Notify System Level CCB of all Level II approvals |
| System | **Chair – OOI SE**<br>OOI Director of Engineering<br>OOI COTR<br>OOI Associate Director (Science)<br>IO PI's<br>IO SE's<br>Design Engineers | Review and approval of all IO approved Level I forwarded over the threshold. | | |
| | | Forward all Level I ECRs to System Level CCBs that change scope of work, interface or a deliverable. Changes that exceed one month in schedule impact and any on the Critical Path. Funding at a Control Account Level. | ↓ | |
| OOI | **Chair OOI PI**<br>OOI Director of Engineering<br>OOI Associate Director (Science)<br>IO PI's<br>Science Community Advisor(s) | Review and approval of all IO approved Level I forwarded over the threshold. | | |
| | | Forward to **NSF** for concurrence any change that exceeds the overall program baselines for cost or schedule. Any change to the floor level of the system capability. Any change that reallocates funding at the level 2 WBS in excess of 10% of the 2nd level value. | ↓ | |

# Change Control Scenarios

- Real World Scenarios:

$ 10,000

- A mooring cable part of a $150,000 work package is redesigned after final design with a new termination fitting. The cost of the redesign is $10,000 still within estimate and budget and two weeks delay of non-critical path. It is classified as Class I due to FFF change. The IO CCB reviews and approves. If no interface issue, it is resolved at IO CCB.

$ 50,000

- An electronic device is determined to be near design capacity and the engineers determine to provide a redundant component in the assembly and split the load between the devices. The cost within the estimated cost of the subsystem, but requires firmware code changes in the assembly. The item is classified as Class I due to change in firmware code and FFF. The ECR is processed at the IO level and forwarded to the System Level to evaluate impact if any to the CI and ensure that the other marine IO is aware of the physical limitation of the device and the new architecture in the system.

$ 270,000

- A new material for buoyancy is developed that has long term benefit in sub-surface moorings. The marine IO desires to switch the material in the design of a mooring. The change will cost 270k and delay the non-critical path work package 6 weeks. The Class is I due to FFF, form of material. The ECR is processed at the IO and forwarded to the System Level CCB for approval. The item is within the contingent cost of the CA, but requires release of contingency for the WP. Sent to the OOI CCB for review and approval.

$ 1,500,000

- The year is 2012 and engineering has determined that the fuel cell will not provide sufficient power in the temperature and wave conditions as were estimated. They request to change the power generation over to a hybrid diesel/fuel cell. Without the conversion they will not meet the science objectives but the schedule will extend past the planned 5 years of the total program. This item is Class I and progresses through all of the CCBs and is presented to NSF for concurrence on the request.

# Question 2. Data policy calls out proprietary use in 2 areas

-**NSF Academics**: Data will be open access to anyone in real-time; however there will be an opportunity to request the during *initial* proposal process. Initially this was proposed to be reviewed by the OOI Facility Governance Group which was not clearly defined. We agree these proprietary requests could be folded into the proposal process and could be judged by the NSF external reviewers and panel. The requested period of data protection might vary with each proposal but could not be longer the current 2-year NSF-embargo.

-**Industry**: OOI will encourage industry involvement, HOWEVER it is expected the industry live by similar rules of open access data. Requests for proprietary protection will be reviewed on a case by case basis by NSF and OOI Facility Governance Group as several different requests will have different implications.

*Example 1 New sensors that need platform*: Chemical and radiological detectors,

*Example 2 Value added data products*: Take core instrument data and then develop a new data product to be sold (similar to NOAA SST).

*Example 3 Facility to provide critical data*. OOI facility provides ocean response to industrial iron fertilization to calibrate the efficacy of north Pacific.

Question 3: The Science Plan calls out "Data will be made publicly available to users through a general web interface, and through distribution to data archives, including the national data repositories. Please elaborate more on the form, function, and extensibility of the web interface.

We will deliver two types of network accessible interfaces:

The first type comprises machine-to-machine interfaces which include the core messaging architecture such as AMQP or ActiveMQ. For external interfaces RSS, THREDDS, Data Turbine, OPeNDAP, WebDev, digital libraries (DSpace, Fedora) will all be provided.

For the human interface using web browsers, search, navigation, and subscription capabilities will be provided. For application interfaces, Kepler and Pegasus workflows are planned, as well as Matlab and IDL interfaces.

# Question 4:
# Staff Diversity in NSF-Funded Programs

- Each IO Institution has policies on diversity, including in hiring practices; Ocean Leadership also practices diversity in hiring.
- As it has done in other programs it manages, Ocean Leadership will initiate proactive programs to entrain underserved groups through active involvement in the OOI program to stimulate interest in the career opportunities offered.

# Question 5: Education and Outreach

- Ocean Leadership will appoint an education coordinator (.5-1 FTE) to serve as the education coordinator for the program, the POC for the IO education managers, and the COTR for the Education Infrastructure Facility.
- IOs provide direct education connection to science and engineering.
- CI-IO education manager is a member of the CI Management Team.
  - liaison between CI and other OOI education representatives
  - ensures that the CI is responsive to education user requirements
- CGSN Deputy Project Manager coordinates education activities with WHOI, SIO and OSU and the Project Office.
- The RSN-IO education team will report to the PI and will ensure coordination of RSN education activities with the wider OOI project (e.g. regular, live, Research Channel Programs from sea, with teachers, during OOI construction stage; etc.).

# Question 6: NEPA Compliance

- PEA Completion: Risk ID #1007 in OOI Risk Log.

•Schedule for NEPA contains 60 days for NSF/OL/TEC internal review, revise, and comment; 10 day public comment; finish date 4/18/07. NSF and OL can shorten internal review periods.

•NSF prefers a 30 day public comment period to reduce litigation risk; no statutory requirement.

•Worse Case: NSB in May, with funds released pending full NEPA completion.

•Worst Case: NSB in August.

•NSF is responsible for NEPA Compliance.

# Question 6 and 10:  Permits

- Permit Activities are not on the critical path, therefore they DO have schedule contingency.
- Which permits stop progress:
  - RSN:  None, if permit delay is less than 12 months (so 240 days built in schedule +360 days)
  - Endurance:  None, schedule tied to RSN
  - Pioneer and Global:  None
- Oregon Ocean Coastal Management Program (OCMP) and the Ocean Policy Advisory Council (OPAC) control the Oregon permits, but history has shown that Oregon will agree to a cable landing provided the Oregon Fishermen's Cable Committee (OFCC) agreement is in place.

# Question 7: O&M Cost

- O&M estimates are directly tied to the MREFC deliverables (ex: RSN cable insurance; global site redundancy). These track the different types of infrastructure being operated and maintained.
- Spend plan for O&M bottom-up estimate is available for drill-down in break-out.
- OL staffing plan to transition to O&M: 9 FTE’s.

# O&M Estimates from IO's (example and staffing transition)

- CGSN:
- RSN:
- CI:

# Question 8:
# Vertical profiler risk mitigation

- Wire-crawler profiler is proven technology
- Winched profilers are transformative
- Winched profilers risk mitigation
  - NRE included for CGSN and RSN
  - In parallel, we will advocate for additional resources (e.g. NSF OTIC, NOPP) for developing hardened winched profilers per recommendations of OL-sponsored July 2007 profiler workshop
  - We will monitor on-going developments (e.g., NEPTUNE Canada-NGK and WET Labs)
  - If necessary, we can proceed incrementally with reduced SUR compliance, e.g., use fixed sensors, enhanced glider sampling, bring wire-crawler closer to surface

# Question 12: Who holds contingency and how is it included in the resource loaded schedule?

- Contingency will be held at Ocean Leadership. It is NOT distributed among the IO's at the outset of the project. Contingency is NOT included in Planned Value.
- The baseline performance plan does NOT include contingency. It is centrally held at Ocean Leadership.
- The Cost Book is used to calculate the amount contingency, on a work package level. Annual budget requests from OL to NSF will include this calculation. OL subawards to IO's will not include contingency. It will be held in a central pool at Ocean Leadership.
- The Change Control Process will be used to authorize and fund contingency requests.

# Question 9: Spending contingency

- What is the process for re-allocating contingency once a risk is retired? OL disperses contingency funds on an as-needed basis. We expect to discuss contingency needs on a monthly basis. We will try to keep 15% of funded work available.
- What is the projection of when contingency is dispersed? It is profiled to the performance of the work. On an annual basis, Ocean Leadership will assess the overall contingency usage quarterly.
- Availability of contingency for up-scope will be considered after major components have been deployed.

# Question 11: CI Example (EVMS with Subawardees)

- □□□□□CI will use estimated actuals for labor in order to provide timely EVMS reporting. This will compensate for UCSD's 30 day latency in accounting practices.
- All CI employees and subawardees will enter estimated actuals (time and expenses) by WBS element on a weekly basis into QuickBooks through its web-based interface extension, Time-Tracker. The estimated actuals will be reconciled against invoices on a monthly basis.

# Question 11: How will IO's and their subawardees use EVMS to manage the project?

- Pre-award
  - Buy-in during Budget and Schedule development
  - "Bottoms up" estimates and plan including sub-awardees
- Baseline
  - Agree to commitments – cost and schedule
  - Concurrence on team responsibilities, dependencies, cost commitments – includes sub-awardees
- Run
  - Use estimated actuals if necessary
  - See variances early thru reporting – summarize entire IO team
  - Analyze why variances are occurring – focus on problems outside established limits
  - Make corrections – e.g. more people, help for engineers, contingency for alternate paths before schedule slip, schedule mods to re-sequence tasks, put tasks in parallel early
- Explore and Correct Emerging Problems Early

# Question 13: Scope of CI IO

- Interfaces are implemented through signed Interface Agreements and costs are allocated in each IO WBS according to the Agreements
  - Statements of responsibility
  - Descriptions of physical and logical interfaces
- CI capabilities are present throughout the OOI network
- The marine IOs are building autonomous power and comms networks
- The CI will make resource requests to the marine networks, who will take action as appropriate
- The CI will have two-way communications directly with instruments

## *Question 14. Please tell us more about your collection of user requirements input, e.g. which community groups have you worked with already, which are in the queue?*

**Past**: Historical documents (14 National reports), the efforts of the 80 community volunteers who worked on Ocean Steering Committee and Science and Technology Advisory Committee.

**Present and Future**:

CSGN – present & future: NRC committee and workshop;Salt Lake City workshop;Tiger teams and regional meetings; CGSN Ad Hoc team; traceability workshops; regional/user meetings

RCN – present & future: Working groups and node specific nodes

CI – present & future: regional meetings, first held in August for ONR & IOOS coastal data assimilative modelers, PNW regional water & tectonic modelers (winter 2008), GCM modelers (spring 2008), NOAA Integrated Ocean Observing Systems (summer 2008).

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First CI User report submitted November 7

*Question 15. This is a large scale software development (and/or integration) project (for an NSF-funded operational research system.) Please tell us what sanity checks for cost, effort, schedule, e.g. against other similar projects of similar scope you have done.*

*What we did*? We have compared this project's cost, effort, and schedule to multiple comparable projects inside and outside the environmental sciences.

*What was our sanity check*? The Project Manager has managed several projects of comparable structure and scope in the past ex: Currinex $60M startup The cost/schedule/risk allocations were vetted across 12 participating institutions, Raytheon reviewed the WBS, cost allocations and provided input on risk assessment

Please show us how you will craft your implementation so that it dovetails well with other large NSF projects. For instance, can a global climate modeler group use OOI as one of 1/2 a dozen (or more) “sensor inputs” to a real-time GCM?

**Many large NSF projects have been thoroughly studied in order to come up with the CI design and architecture. Several major partners on the CI team are heavily involved in these projects. It will be an ongoing process to leverage and learn from these large NSF projects during the implementation phase. CGSN data to be shared to National Data Buoy Center server, where such modelers find data for initialization, also via OceanSITES project, international global ocean time series coordination project**

Specifically, a global climate modeler group can use the OOI data and model products as “sensor inputs” to a real-time GCM. Data from the global observatory can be directly used by global climate models as one of the many “sensor inputs”, along with many other complementary data sets such as from NOAA mooring/buoy network, Argo floats, drifters, satellite data. Data from the regional and coastal observatories, with higher spatial resolution, can be used to improve subgrid-scale parameterizations in these global climate models, usually at much coarser resolutions.

# Question 17 What existing software technologies have you considered/evaluated?

**The NSF Looking project provided a three opportunity to explore a wide of the software technologies to allow an assessment of the best projects for OOI CI.**

Some specific software technologies that was considered for components of OOI CI

Teragrid, Open Science Grid (OSG),
National Virtual Observatory (NVO),
Biomedical Informatics Research Network (BIRN),
Science Environment for Ecological Knowledge (SEEK),
Geosciences Network (GEON)
Telescience Project, Linked Environments for Atmospheric Discovery (LEAD)
National Ecological Observatory Network (NEON)
DSpace
Fedora
Optical networking Internet Protocol Computer (OptIPuter),
Canada's advanced Internet development organization (CANARIE),
Common Instrument Middleware Architecture (CIMA),
Java Distributed Data Acquisition and Control (JDDAC),
Grid Enabled Remote Instrumentation with
Distributed Control and Computation (GRIDCC)

## Question 18. The interface documents for the internal systems seems good. We would like to understand some additional details about the science user interface.

The science user interface will follow the outline suggested by the Concept of Operations, which suggests a portal with multiple observatory, data, and community functions. The primary interface will be presented via this web portal, but additional software interfaces (e.g., APIs) will also be provided. The details of the interface are naturally to be determined

The first is machine-to-machine interfaces which include the core messaging architecture such as AMQP or ActiveMQ. For external interfaces RSS, THREDDS, Data Turbine, OPeNDAP, WebDev, digital libraries (DSpace, Fedora) will all be provided.

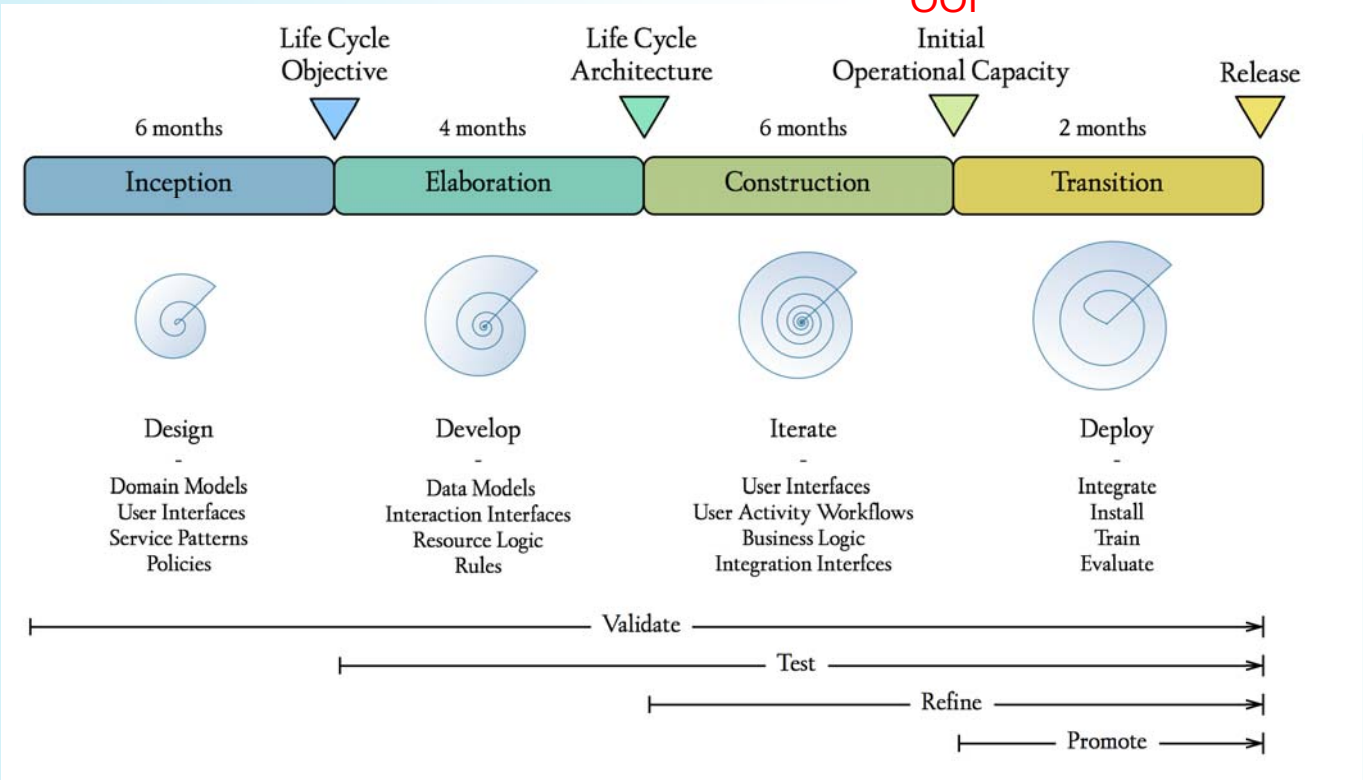
For the human interface using web browsers there will be search, navigation, and subscription capabilities provided. For application interfaces, Kepler and Pegasus workflows are planned, as well as Matlab and IDL interfaces.

# Question 19. Where are the evaluation points in the spiral cycles and how are they done? What have you evaluated so far?

Community can observe prototypes

Community can test Software on OOI

Community can test Refines software on OOI

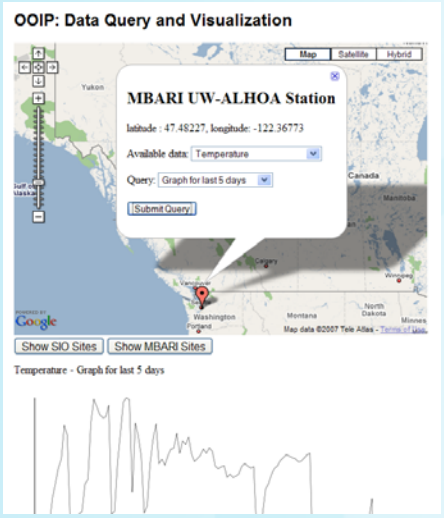


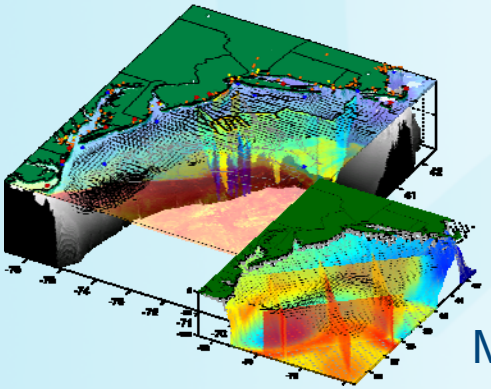

This cycle will be conducted for each subsystem for release

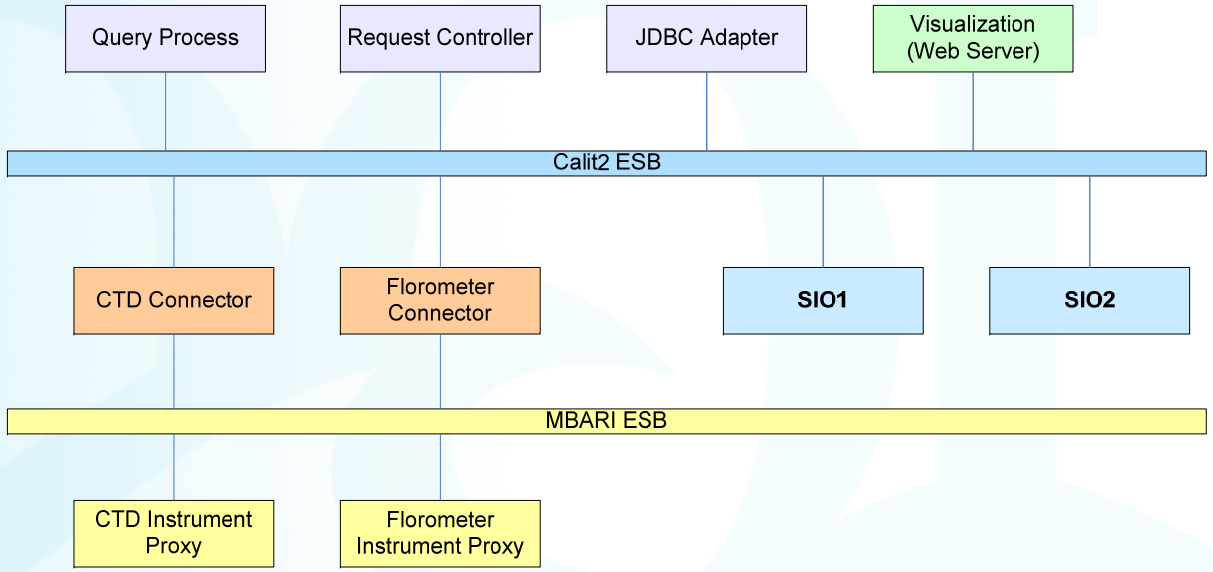
# Question 20. Has prototyping of any of the CI been done? Is it planned?

Many CI elements have been prototyped internally or by partner projects, including key Common Operating Infrastructure elements. Most of the high-risk elements will be prototyped within the first 6 months of the start of funding.

Prototyping was initiated, on paper, with the Looking program. It is/will be prototyped on the MBARI sensor project, the Mid-Atlantic Coastal Ocean Observing System (MarCOOS), Enterprise Service Bus Policy based Governance (UIUC, NCSU), Roadnet/Kepler






MARCOOS network

# Question 21. Can you explain what synergies there might be with other major NSF-funded long-term data efforts (outside of OOI.)

We expect there to be synergies on multiple levels and we foresee many opportunities for software and knowledge reuse will continue to be applied.

*The software technology will be re-useable: Distribute and provide leverage to other programs. These efforts should be coordinated through the NSF Environmental Observing Networks (EONs) to allow LTER (CI team joining the network), NEON, Complex Waters (Cleaner).*

The OOI software will couple to the Irods/SRB digital library

It will be capable of direct integration/utilization to the Teragrid and Open sides grids

It will feed many data repositories *(FGDC, GCMD, Iris, OBIS)*

## Question 22. Can you explain to us the functionality of the first two (CI) deliverables?

Release 1 will provide all the core services needed to create a basic data acquisition and delivery system, including the ability to archive the data, and to store it. It will be tested and operating with both real and simulated instruments.

Release 2 will add more sophisticated abilities, such as grouping and classifying, and re-broadcasting data; providing access to external services; and distributing data in a dynamic way.