R2R Shipboard Sampling Event Logger

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Woods Hole Oceanographic Institution

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RVTEC 2012 Meeting
Lamont Doherty Earth Observatory

R2R Event Logger System is not . . .

- Mandatory
- A replacement for existing event loggers
- An underway data logger

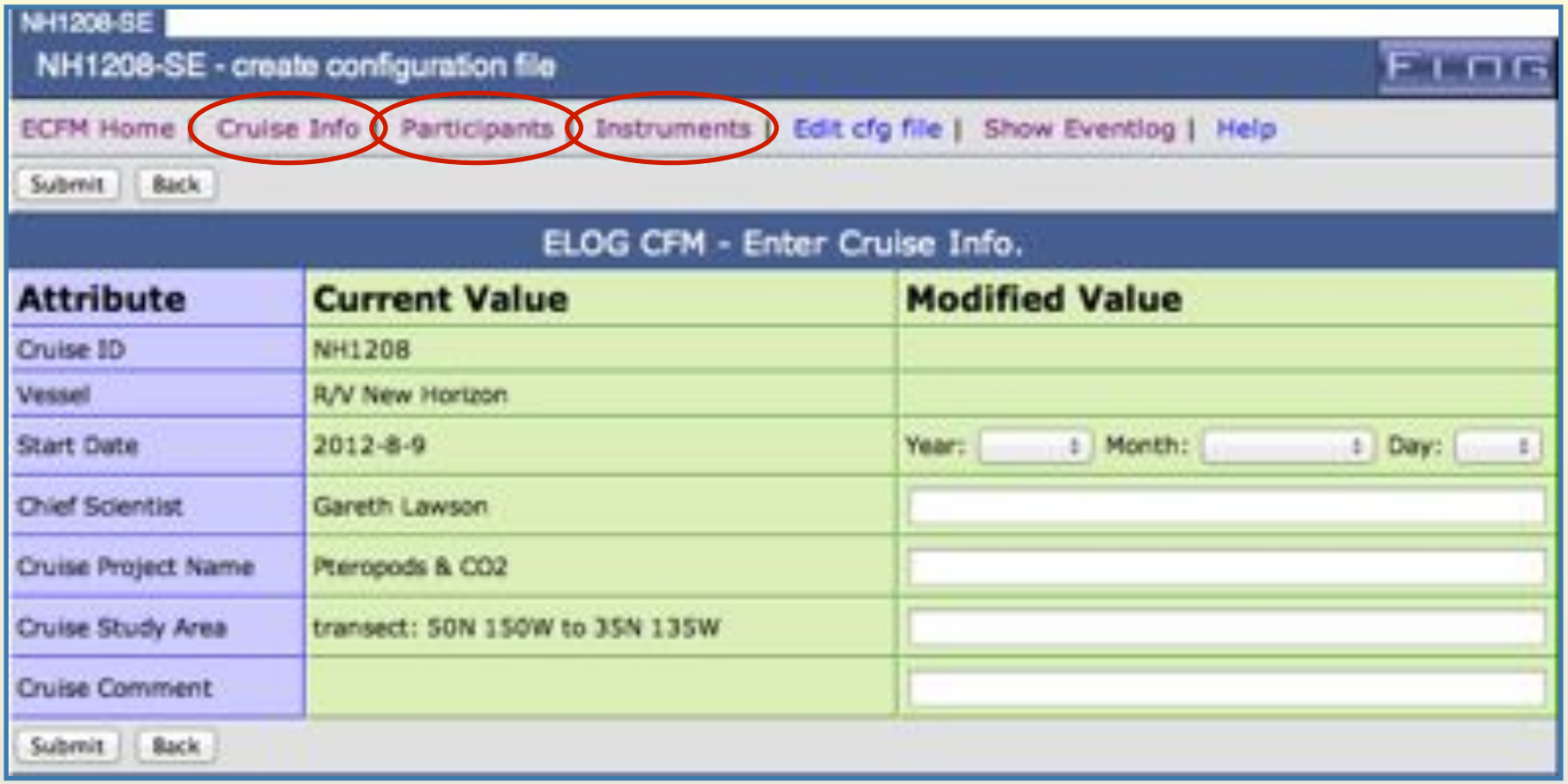
- IMPORTANT NOTE: When the R2R event logging system is deployed on a vessel, it is the responsibility of the science party and not the shipboard technician to enter information in the event log during the cruise.

R2R Event Logger System . . .

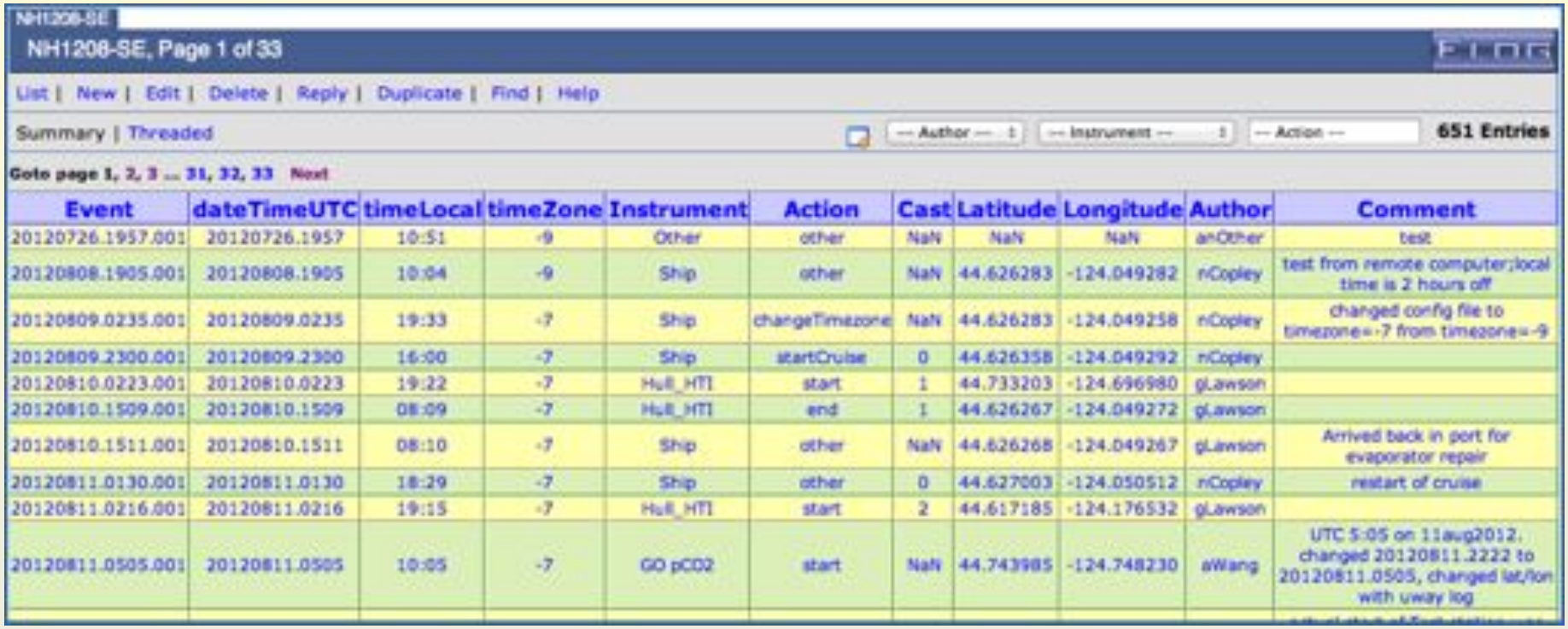
- A way for scientists to create a digital record of instrument deployments and other significant events that happen during a research cruise
- Systematic approach to recording: time, position, activity
- Unique identifiers for sampling events
- Auto-entry of as much information as possible
- Use of controlled term lists for select information
- Enables near real-time communication of events to remote collaborators
- Resultant event log is consistent across the fleet
- Uses ELOG (open source, public domain software) https://midas.psi.ch/elog/

Step 1. Register to use it at www.rvdata.us/contact/elog

Step 2. Configure it before the cruise



Step 3. Use it during (and after) the cruise



NH1208-SE, Page 1 of 33

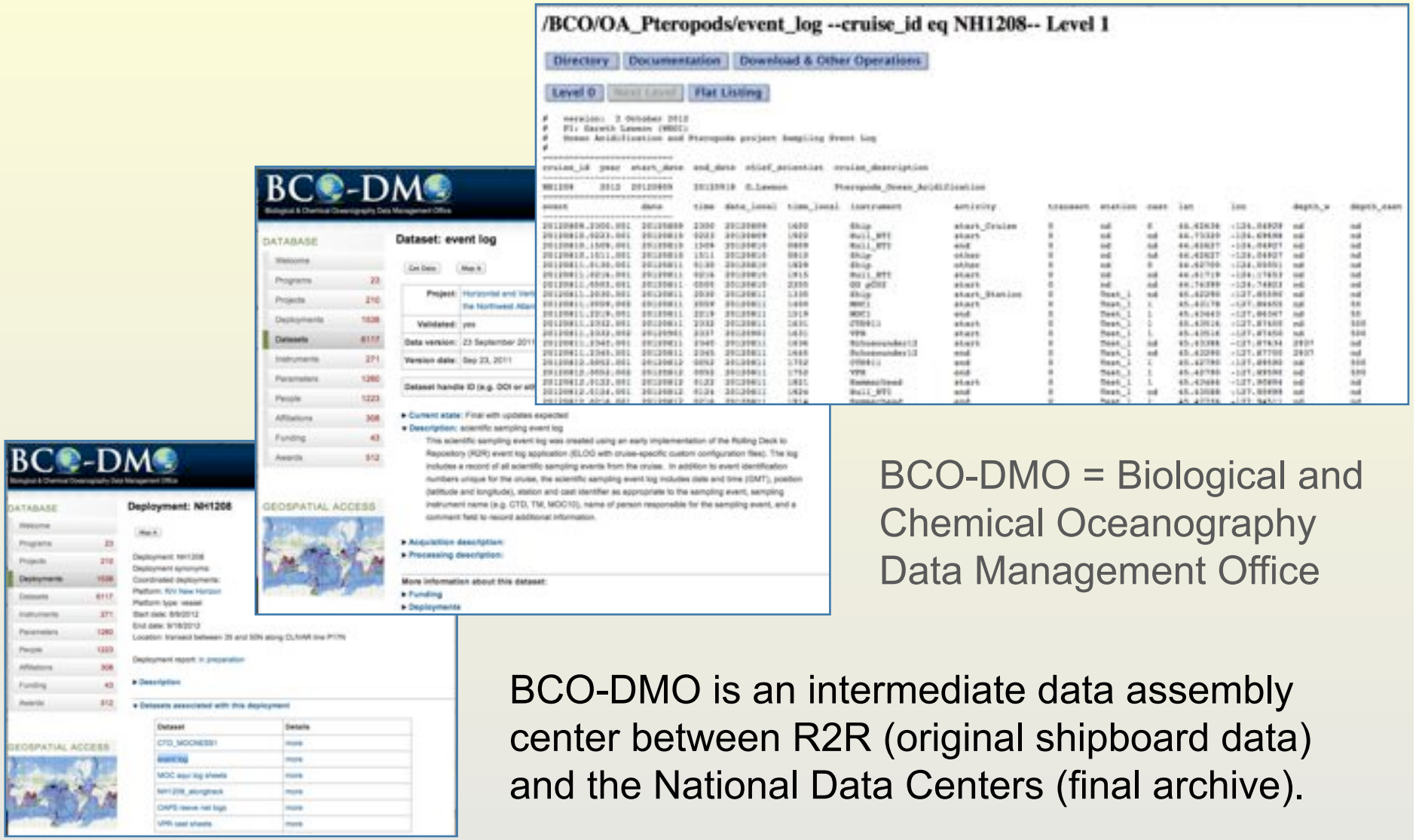
List | New | Edit | Delete | Reply | Duplicate | Find | Help

Summary | Threaded — Author — — Instrument — — Action — 651 Entries

Goto page 1, 2, 3 ... 31, 32, 33 Next

Event	dateTimeUTC	timeLocal	timeZone	Instrument	Action	Cast	Latitude	Longitude	Author	Comment
20120726.1957.001	20120726.1957	10:51	-9	Other	other	NaN	NaN	NaN	anOther	test
20120808.1905.001	20120808.1905	10:04	-9	Ship	other	NaN	44.626283	-124.049282	nCopley	test from remote computer;local time is 2 hours off
20120809.0235.001	20120809.0235	19:33	-7	Ship	changeTimezone	NaN	44.626283	-124.049258	nCopley	changed config file to timezone=-7 from timezone=-9
20120809.2300.001	20120809.2300	16:00	-7	Ship	startCruise	0	44.626358	-124.049292	nCopley	
20120810.0223.001	20120810.0223	19:22	-7	Hull_HTI	start	1	44.733203	-124.696980	gLawson	
20120810.1509.001	20120810.1509	08:09	-7	Hull_HTI	end	1	44.626267	-124.049272	gLawson	
20120810.1511.001	20120810.1511	08:10	-7	Ship	other	NaN	44.626268	-124.049267	gLawson	Arrived back in port for evaporator repair
20120811.0130.001	20120811.0130	18:29	-7	Ship	other	0	44.627003	-124.050512	nCopley	restart of cruise
20120811.0216.001	20120811.0216	19:15	-7	Hull_HTI	start	2	44.617185	-124.176532	gLawson	
20120811.0505.001	20120811.0505	10:05	-7	GO pCO2	start	NaN	44.743985	-124.748230	aWang	UTC 5:05 on 11aug2012. changed 20120811.2222 to 20120811.0505, changed lat/lon with uway log

Step 4. Integrate it into Ocean Data Repositories



BCO-DMO = Biological and Chemical Oceanography Data Management Office

BCO-DMO is an intermediate data assembly center between R2R (original shipboard data) and the National Data Centers (final archive).

Event Logger Cruises

Deployed on 30 Cruises to date, (12 Ships/Sites), 12 Pis, 5 Pis have used it more than once.

2012 Cruises:

AE1211	David Black (SUNY)	BaRFlux
AT19	Craig Lee (UW)	LATMIX2 Multi-Ship
EN502	Cindy Lee (UW)	CTD
EN513	David Black (SUNY)	BaRFlux
EN520	David Black (SUNY)	BaRFlux
KN205	Jody Klymak (UVic)	LATMIX2 Multi-Ship
KN207-01	Benjamin Van Mooy (WHOI)	CTD, Sed Traps
KN207-02	Charles Langmuir (Harvard)	MAR Rocks
KN207-03	Kay Bidle (Rutgers)	CTD
KN208	John Toole (WHI)	Moorings
KN209-01	Ray Schmitt (WHOI)	Jason
MGL1211	Suzanne Carbotte (LDEO)	Cascadia Multi-Ship
MV1206	Anne Trehu (OSU)	OBS
OC1206A	Juan Pablo Canales (WHOI)	Cascadia Multi-Ship
OC1209A	Anne Trehu (OSU)	OBS
RA12003	Seth Ackerman (USGS)	WHSC
TN274	Doug Wiens (WUStL)	OBS/OBH
TN286	*(rescheduled)*	OOI

Since RVTEC 2011 …

- Have continued deploying netbook (version 1) for chief scientists requesting Eventlogger services.
- Decided to switch shipboard hardware for version 2 from a netbook running Linux to a pluggable Linux computer.
  - Dreamplug
  - SD card for software distributions, 2 Ethernet ports, Wifi
  - Flexible platform for future shipboard applications
- Ability to “Add Missed Events” rose to a top priority, requiring a “fix” before final distribution of version 2
- Ability for science party to configure the eventlogger while in port (rather than shoreside config) became a top priority as well
- Cindy Sellers joined the R2R Eventlogger team 6 weeks ago. She’ll be contacting you soon

Transitioning to Shipboard R2R Eventlogger 2.0

CPU - Marvell Kirkwood 88F6281 @ 1.2GHz speed
Linux 2.6.3x Kernel
512MB 16bit DDR2-800 MHz
2MB SPI NOR Flash for uboot
4 GB on board micro-SD for kernel and root file system
2 x Gigabit Ethernet 10/100/1000 Mbps
2 x USB 2.0 ports (Host)
1 x eSATA 2.0 port -3Gbps SATAII
1 x SD socket for user expansion/application
WiFi 802.11 b/g/n
Bluetooth 3.0
Audio Interfaces
5V3A DC power supply

Buy with JTAG Combo and SAVE $10

Options: US Model - Price: $159.00 (USD)

Quantity: 1 Add to Cart

R2R Event Logger 2.0 deployment ~ 2013 Timeline

- Now – gathering shipboard network information from operators to configure Dreamplug servers (Cindy will be sending email to rvtec list as a start.
- March 2013 – delivering Dreamplug embedded Linux units and SD card distriutions to RVTEC “technical advisors” for beta testing
- March - April 2013 – active beta testing (and updating) period (looking for candidate cruises)
- May-December 2013 – deployment of Version 2.0 Eventlogger Dreamplugs to ships/operators that request it.

Eventlogger Configuration Information we need:

- Contact person for Cindy Sellers to talk to about this stuff
- Name of ship
- Navigation source availability on net
  - UDP port preferred
  - GPRMC, GPGGA
  - Can we help get serial source on UDP?
- Time source availability on net (NTP and/or GPS)
- Depth source availability on net
- Shipboard network IP information for server
- Info about shipboard network setup and use policy
  - reverse tunnels (for support of server), rsyncing events to shore
  - Science network access, etc.
- Shipping address for hardware

Eventlogger 2.0 Related Links.

- Elog Configuration File Maker User Guide (Alpha Release)
  - http://r2rqq03.whoi.edu/elog/help
- Request to use R2R Eventlogger
  - www.rvdata.us/contact/elog
  - (specify “Testing” for vessel if you’d like to try out ECFM)
- DreamPLug Hardware specs (will support)
  - http://www.globalscaletechnologies.com/t-dreamplugdetails.aspx
- D2Plug Hardware specs (may support)
  - http://www.globalscaletechnologies.com/p-53-d2-plug.aspx

- Questions re shipboard deployments – amaffei@whoi.edu

Event Logger AGU Poster

Rolling Deck to Repository (R2R): R2R Eventlogger: Community-wide Recording of Oceanographic Cruise Science

Poster OS51E-1921
AGU Fall Meeting
December 7, 2012

Authors: Andrew R. Maffei[1], Cynthia L. Chandler[1], Laura Stolp[1], Stephen Lerner[1], James Avery[1], Tim Thiel[2]

[1]Woods Hole Oceanographic Institution, [2]Thiel Engineering

rvdata.us

Abstract

Methods used by researchers to track science events during a science research cruise - and to note when and where these occur - varies widely. Handwritten notebooks, printed forms, watch-keeper logbooks, data-logging software, and customized software have all been employed. The quality of scientific results is affected by the consistency and care with which such events are recorded and integration of multi-cruise results is hampered because recording methods vary widely from cruise to cruise.

The Rolling Deck to Repository (R2R) program has developed an Eventlogger system that will eventually be deployed on most vessels in the academic research fleet. It is based on the open software package called ELOG (http://midas.psi.ch/elog/) originally authored by Stefan Ritt and enhanced by our team. Lessons have been learned in its development and use on several research cruises. We have worked hard to find approaches that encourage cruise participants to use tools like the eventlogger. We examine these lessons and several eventlogger datasets from past cruises. We further describe how the R2R Science Eventlogger works in concert with the other R2R program elements to help coordinate research vessels into a coordinated mobile observing fleet.

Making use of data collected on different research cruises is enabled by adopting common ways of describing science events, the science instruments employed, the data collected, etc. The use of controlled vocabularies and the practice of mapping these local vocabularies to accepted oceanographic community vocabularies helps to bind shipboard research events from different cruises into a more cohesive set of fleet-wide events that can be queried and examined in a cross-cruise manner. Examples of the use of the eventlogger during multi-cruise oceanographic research programs along with examples of resultant eventlogger data will be presented. Additionally we will highlight the importance of vocabulary use strategies to the success of the Eventlogger use by the research community.

In the future, the R2R Science Eventlogger will run on a dedicated "plugable" linux computer installed on each research vessel network. Best practice documents supporting increased consistency for underway instrument data collection, quality assessment of underway instrument data, and other useful capabilities made available on this common shipboard server platform will begin to provide a common set of web-services and science software tools for the "fleet-observatory".

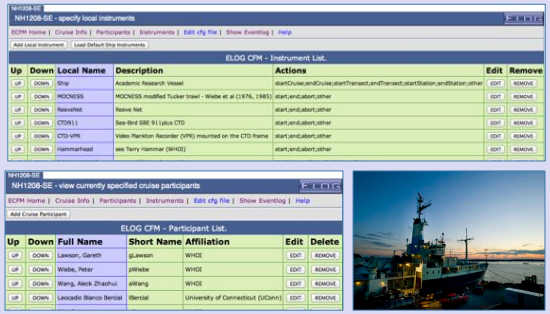
http://rvdata.us/

The Rolling Deck to Repository Project acknowledges support from the NSF Oceanographic Instrumentation and Technical Services (OITS) Program.

1 Register to use it

http://www.rvdata.us/contact/elog

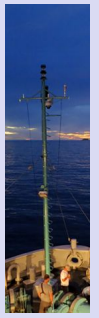
2 Configure it before Cruise



3 Use it during Cruise

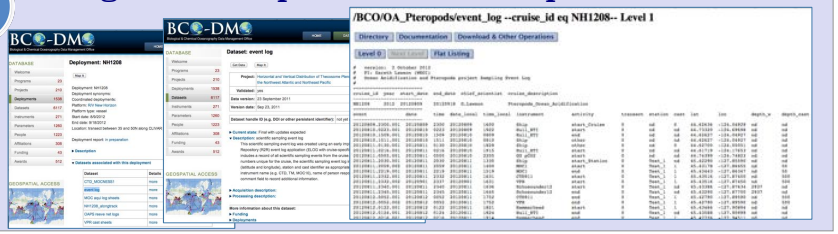
The full log of sampling events can be viewed during cruise.

Sampling events are recorded during the cruise. New events (see below) can be entered using a browser client running on any networked device.



4 Cruise data in R2R Catalog

5 Integrate R2R products into repositories



Elogger Cruises

		Chief Scientist	Affiliation	Type of Cruise
R/V Atlantic Explorer	AE1211	David Black	Stony Brook	
R/V Atlantis	AT18-06	Peter Lemmond	WHOI	EM122 Trials
	AT18-12	Scott Nooner	LDEO	Geodetic Surveys/ Jason
	AT18-13	None	WHOI	Transit
	AT18-14	Ginny Edgecomb	WHOI	
	AT19	Craig Lee	UW	LATMIX2 Multiship Project
R/V Cape Hatteras	CH0511	Jim Ledwell	WHOI	LatMix1 Multiship Project
R/V Endeavor	EN484	Gareth Lawson	WHOI	CTD/MOC
	EN487	Gareth Lawson	WHOI	CTD/MOC
	EN494	Tom Sanford	URI	LatMix1 Multiship Project
	EN502	Cindy Lee	UW	CTD
	EN513	David Black	Stony Brook	CTD
	EN520	David Black	Stony Brook	CTD
R/V Knorr	KN200-02	Dave Herbert	URI	Hydrographic Survey
	KN200-04	Craig Lee	UW	Hydrographic Survey
	KN203-04	Craig Lee	UW	Hydrographic Survey
	KN205	Jody Klymak	UVIC	LatMix2 Multiship Project
	KN207-01	Benjamin Van Mooy	WHOI	CTD, Sediment Traps
	KN207-02	Kay Bidle	Rutgers	CTD
	KN207-03	Charles Langmuir	Harvard	Rock Sampling
	KN208	John Toole	WHOI	Moorings
	KN209-01	Ray Schmitt	WHOI	Jason
R/V Langseth	MGL1211	Suzanne Carbotte	LDEO	CASCADIA Multiship Project
R/V Melville	MV1108	Peter Lonsdale	SIO	Multibeam
	MV1206	Anne Trehu	OSU	OBS
R/V New Horizon	NH1208	Gareth Lawson	WHOI	CTD/MOC
R/V Oceanus (WHOI)	OC462	Chris Oberhaus	NOAA	Dart Mooring
	OC467	Dennis McGillicudy	WHOI	CTD/Floats
	OC468-02	Joseph Montoya	GIT	CTD/MOC
	OC471-04	Craig Lee	UW	LatMix1 Multiship Project
	OC473	Gareth Lawson	WHOI	CTD/MOC
	OC475	Bob Weller	WHOI	OOI/CGSN Mooring
	OC476-01	Steven Magnanni	WHOI	Carbon Transport/ CTD/Moorings
R/V Oceanus (OSU)	OC1206A	Juan Pablo Canales	WHOI	CASCADIA Multiship Project
	OC1209A	Anne Trehu	OSU	OBS
R/V Rafael	RA12003	Seth Ackerman	USGS	
R/V Thomas Thompson	TN268	Deb Kelley	UW	OOI/RSN Cable
	TN274	Douglas Wiens	WUSTL	Passive Seismics
	TN286			OOI
Shoreside Server	SS-00001	Cindy Sellers	WHOI	LatMix1 Multiship Project

It Takes a Team
Students
Technicians
Researchers
Data Managers

CTD QA Poster – Carolina Nobre

Rolling Deck to Repository (R2R): Quality Assessment of CTD Profile Data

RVTEC Meeting
February 11-15, 2013
Palisades, NY

Authors: Carolina Nobre, Cynthia L. Chandler, Andrew R. Maffei, and Bob Arko, Woods Hole Oceanographic Institution

http://www.rvdata.us/

rvdata.us

Abstract

Goal:

Provide a set of scripts for the fleet.rvdata.us server to assess the quality of a given CTD data set collected during a research cruise. The scripts will generate an xml report as their primary output, which will score the CTD data according to a pre-determined list of quality assessment criteria. This xml report will be read by other quality assessment software on the R2R site to do things like display a dashboard that provides users with quality assessment information.

Steps:

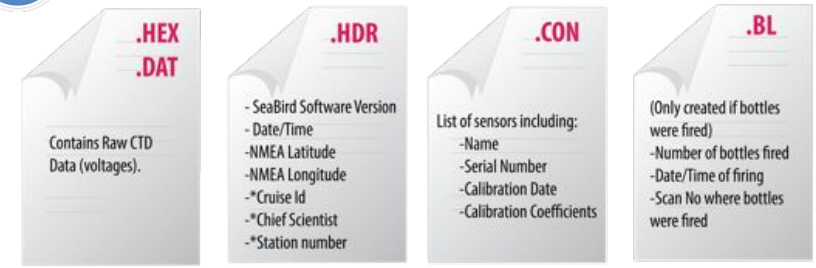
1) The shipboard data distribution arrives at the rvdata facility and software is used to split the distribution into file sets for each of the underway instrument types that R2R supports. The set of files for an underway instrument is called a "file set". Currently, all ships use the SeaBird 911plus CTD, processing software, and auxiliary files provided by Seabird.

2) An expert in CTD data regularly visits the fleet.rvdata.us site and checks a list of cruises that require their CTD data to be assessed. A suite of CTD quality assessment routines are then run on those data and monitors the error and other output to verify scripts have executed properly.

3) Once the QA scripts are run on the CTD file set, an XML report is generated with ratings for each parameter of interest. Each parameter can receive a rating of good, average, or poor, represented by a shape (circle, triangle, square) and color (green, yellow, red). The criteria which determine how a given parameter is rated are specified in the QA scripts and can be adjusted to make allowances for extenuating circumstances. The XML file will be placed in a directory structure specified in R2R procedures.

The Rolling Deck to Repository Project acknowledges support from the National Science Foundation (NSF) Oceanographic Instrumentation and Technical Services (OITS) Program.

1 Extracting Information from Raw SeaBird Files



2 Creating ASCII CTD Files

3 Quality Assessment Tests

- **Range Test**
  Test that all measurements/values fall within established upper and lower limits (manufactured specs for sensor)
- **Excessive Gradient Test**
  Evaluate difference between 3 successive measurements of a parameter and check that results is less than the maximum allowable change defined for a specific time interval.
- **Outlier Test**
  Check for data values more than M times the standard deviation away from a mean series.
- **Spike Test**
  Evaluate the difference between sequential measurements to evaluate spikes in the data.
- **Constant Value Test**
  Evaluate a value that does not change more than the resolution of the sensor over a period of several observations.
- **Gap Test**
  Max time interval over which no data are reported.
- **Min Pressure Test**
  Test for minimum pressure for all casts.
- **SeaBird File Extent Type Text**
  Test for presence/absence of standard SeaBird file types.

It Takes a Team
Students
Technicians
Researchers
Data Managers


thank you

Miscellaneous Extra Slides

- ELOG Configuration File Maker (ECFM) running on Dreamplug at WHOI (Alpha Release)
  - http://r2rqq03.whoi.edu:8090/qq0002-SE/?cmd=ecfmhome

Event Logger ~ 2014 (R2R year 5)

Ongoing Tasks

- Provide a QA'd version of the shipboard eventlog as an R2R Product
- Ongoing maintenance releases of Eventlogger/Dreamplug software to ships
- Ongoing operations support for Eventlogger configuration by science party on ships (in port) and shore

Possible Future Developments

- ❖ Support collection of regular, automated instrument events in separate logbook (ttest w Gravimeter, ADCP, CTD?)
- ❖ Use R2R shipboard server (Dreamplug) for other purposes (shipboard R2R QA, RVTEC best practices doc server, …)

Shipboard Sampling Eventlogger Version 2.0-1

	Version 1	Version 2
Intended Use	For chief scientists on cruise-by-cruise basis	To be deployed on all US academic fleet vessels that request it.
Availability	Early 2011	Spring 2013
Deployment Mechanism	Netbook computer “FedEx’d” to ships and returned to WHOI on cruise-by-cruise basis 	Permanently installed R2R embedded Linux computer (DreamPlug) 
ELOG configfile generation	Hand built, customized via scientist interviews	Setup by chief-scientist on elog.rvdata.us website before cruise **or** on ship while in port.
Controlled Vocabularies	Loosely applied during manual configuration phase	Rigorously supported in new software for persons, affiliations, instruments, and actions. Vocabulary mods and additions governed via SeaVox and R2R procedures

Shipboard Sampling Eventlogger Version 2.0-1

	Version 1	Version 2
Final File Format	ELOG CSV Export and final ELOG config file	Working to define a standard format to be agreed on by both R2R and Eurofleet
Documentation	basic ELOG documentation	R2R Event Logger specific documentation is currently available in in beta version of 2.0 (pending review by RVTEC technical advisors)

Eventlogger Project Future Plans?

Ongoing Tasks

- Provide a QA'd version of the shipboard eventlog as an R2R Data Product
- Regular maintenance releases of Eventlogger software to ships via SD card images
- Ongoing support for Eventlogger configuration and usage by science party

Adding New Features?

- ❖Addition of new features as requested by science and deemed of high priority
- ❖One idea - support for optional, automated, regular (hourly?, daily?) status reports by instrument systems (test first with gravimeter, ADCP, CTD)

Why is an event log needed?

- Research vessels are an essential part of the global observing system
- *in situ* data can be collected only once (in space and time)
- oceanographic data are expensive to collect
  - Specialized equipment
  - Highly trained people
  - Fuel costs

- Recognition of these facts led to the R2R project of which the event log system development is one part.

Discussion Topics

- Cruise Sampling Event Log
  (device deployment metadata for science)
  - what it isn't
  - what it is
  - why
  - features
  - futures
  - cruises
  - questions

Event Logger ~ 2013 Timeline (R2R year 4)

- 2012 status – Have continued deploying netbook (version 1) for chief scientists requesting Eventlogger services. Version 2 Elog deployment has been delayed due to 3 new features deemed crucial to successful deployment:
  - Decision to move from netbook to Dreamplugs for permanent install
  - Ability to more easily add missed events
  - Ability to do configuration onboard vessel in addition to on shore
- Jan-Mar 2013 – finishing up coding and testing
- Apr-Dec 2013 – deployment of Version 2: Eventlogger Dreamplugs on ships

Eventlogger Technical Advisor Volunteers to date

- Jon Meyer (Scripps)
- Webb Pinner (NOAA)
- Jim Postel (UW)
- Bill Fanning (URI)
- John Haverlack (U Alaska)
- Others?