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SensorNIS WG

The SensorNIS project was started in collaboration with the North Eastern Research Collaboration (NERC). An initial workshop was held at HBR in October 2011.

Attachment	Size
sensor best practices review [1]	736.83 KB

Sensor management best practices workshop, April 2 - 4, 2013

Workshop participants:
In-person:
Don Henshaw (AND)
Corinna Gries (NTL)
Renee Brown (SEV)
Adam Kennedy (AND)
Richard Cary (CWT)
Mary Martin (HBR)
Christine Laney (UTEP, JRN)
Jennifer Morse (NWT)
Chris Jones (DataONE)
Branko Zdravkovic (Univ of Saskatchewan)
Scotty Strachan (Univ of Nevada-Reno)

Remote:
Jordan Read (USGS)
Jason Downing (BNZ)
Wade Sheldon (GCE)

Agenda

Tuesday April 2, 2013	
Time	Activity
8:00 am - 8:30 am	Breakfast catered at LNO
8:30 am - 8:45 am	Don Henshaw: Introduction, review of past workshops, survey results
8:45 am - 10:00 am	• Short introduction to sensor set ups of participants (three slides/five minutes max) • Please present the one problem statement that is most burning to you right now (example [2])
10:00 am - 10:15 am	break
10:15 am - 10:30 am	Chris Jones: The DataONE perspective on managing streaming sensor data
10:30 am - 10:45 am	Jordan Read: USGS and streaming sensor data management
10:45 am - 11:00 am	TBD: CUAHSI's ODM2 activities
11:00 am - 12:30 pm	Discuss goal, audience, and scope of BP document review sensor best practice outline and break into working groups
12:30 pm - 1:30 pm	lunch on your own
1:30 pm - 4:30 pm	Breakout groups: • Data acquisition and transmission

	◦ Leader: Renee ◦ Members: Richard, Scotty, Branko, Adam, Chris • Sensor management, tracking, and documentation ◦ Leader: Corinna ◦ Members: Jen, Christine, Mary, Don, Jordan
4:30 pm - 5:30 pm	report back from breakout groups and plenary discussion
Wednesday April 3, 2013	
8:00 am - 8:30 am	breakfast catered at LNO
8:30 am - 11:30 am	Breakout groups • Streaming data management middleware ◦ Co-leaders: Christine, Branko ◦ Members: Chris, Corinna, Jordan, Renee, Richard • Sensor data quality assurance/ quality control (QA/QC) ◦ Co-leaders: Mary, Don ◦ Members: Wade, Jen, Adam, Scotty
11:30 am - 12:30 pm	report back from breakout groups and plenary discussion
12:30 pm - 1:30 pm	lunch on your own
1:30 pm - 4:30 pm	Breakout groups • Sensor Data archiving ◦ Leader: Don ◦ Members: Chris, Mary, Richard, Corinna, Branco, Christine • Sensor, site, and platform selection ◦ Leader: Adam ◦ Members: Renee, Jen, Scotty
4:30 pm - 5:30 pm	report back from breakout groups and plenary discussion
Thursday April 4, 2013	
8:00 am - 8:30 am	Breakfast catered at LNO
8:30 am - 12:00 pm	breakout groups clean up their materials and post on ESIP wiki
12:00 pm	adjourn

In preparation for the workshop, please:

- Prepare 3 slides max describing the sensor system at your site (or other key information you wish to share)
- Prepare problem statements for your site. Consider one topic and describe your most pressing issue.
- Review current outline of your selected areas. Begin to identify community standards, sources of materials from other groups and agencies pertaining to your selected areas. Consider a decision tree for organizing best practices materials
- Post resource links or documents on the Drupal page
- Review other posted notes (http://im.lternet.edu/node/1145). The HBR 2011 workshop notes may offer good suggestions (http://im.lternet.edu/node/956)
- Summarize existing surveys (Christine, Mary – Smart Forests)
- Example of a wiki page: http://www.landscapetoolbox.org/ (from Christine)

Problem Statements

Here we'll collect the problems statements

Sensor Management - problem statement - planning

Programs involving sensor networks often neglect detailed planning

Successful sensor networks involve tight collaboration among people with diverse areas of expertise. Networks without clear communication of requirements, design, implementation, access, and data archive plans are likely to be unsustainable. Planning combats institutional memory loss, and sets expectations at all levels, from funding to field work, analysis and impact.

Sensor management: Problem statement - communication

Programs involving sensor networks often neglect detailed planning

Successful sensor networks involve tight collaboration among people with diverse areas of expertise. Networks without clear communication of requirements, design, implementation, access, and data archive plans are likely to be unsustainable. Planning combats institutional memory loss, and sets expectations at all levels, from funding to field work, analysis and impact.

Sensor management: Problem statement - data archiving

Problem statement - data archiving

- There is a need to post streaming data in near real-time (once per day). What level of QA/QC checking is necessary before provisional data can be posted?
- Once data are appropriately checked, should grossly incorrect or impossible data be removed? Should data that is known to be incorrect due to observed issues in the field be removed or simply flagged?
- What is the obligation to provide gap-filling on data sets or providing derived data sets such as daily summary data? I will assume these data should be tagged with a data quality flag to describe the level of manipulation.
- How often should corrected data sets be archived in the LTER NIS or other repository?
- In cases where a new sensor replaces an existing sensor occurs, and the new sensor employs a different method or has different detection limits or precision, should a new data stream be identified? Is it sufficient to tag these type of occurrences with a method qualifier flag and continue the same data stream?

Resources
Providing the level and description of quality checking will be essential. See links in the posted resource document:
Assignment of data quality level [3]

Sensor management: Problem statement 1

Problem statement

- terrestrial sensor-based monitoring networks need to be serviced by multiple techs over time,
- consistent methods and reporting are necessary.
- Following procedure and documenting activity is not always easy under field conditions. v
- Maintenance data need to be timestamped and digital so that they can be tied to individual observations as part of a QA audit/query.
- Software/hardware management tools need to be affordable/manageable according to scale.
- Environments are harsh, not supporting of labels. Lists/attributes are one thing, diagrams/maps/as-builts are another.
- Sensor locations can be given an XYZ (super-high-res GPS or absolute from a center reference).

Resources
I'm at the ground level on this one, so I can't point to a specific working software resource or turnkey system. I think the key is designing your "cyberinfrastructure" to incorporate this as part of the observational database itself. This assumes a large role of a computer scientist/DBA.

Scope and audience of the document

Environmental sensing with focus on:
field deployable sensors
terrestrial, aquatic (fresh, ocean), atmospheric
point, line, polygon

but not:
not remote sensing - large raster based images which required a different set of tool for analysis
what about three dimensional stream profiling, acoustic doppler sensors, different tools for analysis

use examples from terrestrial and aquatic installations

General Resources

Links to other groups, standards etc.

- Standards for Observation and Archiving of LTER Climate Data - 1999 [4]
- References: Assignment of data quality level [5]

- References: QA/QC procedures and data qualifier flags [6]

References: Assignment of data quality level

Attachment	Size
References: Assignment of data quality level [3]	101.12 KB

Glossary

Terms that need clarification

20 March 2013 vtc: Sensor best practices workshop planning

Agenda:

1. Introductions
2. Best practice outline topic areas
a. Areas of emphasis
3. Pre-workshop activities:
a. Survey summaries (Mary, Renee)
b. Identify other resources
3. Discuss scope of workshop and expected products
a. Solicit and assemble contributions
b. Compile resources
c. Enlist editors to moderate each topical section

Links:
EnviroSensing Cluster [7]
NERC/SensorNIS 2011 workshop notes [8]
ASM workshop notes [9]

Attachment	Size
Workshop participants, selected areas of emphasis, and homework [10]	65.47 KB

5 March 2013 vtc: Sensor best practices workshop planning

Agenda:

1. Logistics (participants, reservations, new invitees?)
2. Pre-workshop activities:
a. Surveys (Rene/Inigo, Smart forests, Christine)
b. Other research?
3. Discuss scope of workshop and expected products
a. Which parts of resource guide should we focus on?

Links:
EnviroSensing Cluster [7]
NERC/SensorNIS 2011 workshop notes [8]
ASM workshop notes [9]

Rene/Inigo draft survey [11]
USFS Smart Forests survey [12]

October 2011 Workshop Material

text

Pre-Workshop Survey

Survey summary results [13]

Workshop Agenda

Joint NERC Environmental Sensor Network/SensorNIS Workshop October 24-27, 2011 Hubbard Brook Experimental Forest, NH

Monday – October 24
Travel and check-in

Tuesday – October 25
8:00 Continental Breakfast at Pierce Lab (Hubbard Brook Experimental Forest)
9:00 Welcome/Introductions (Lindsey Rustad)
9:15 Sensor Sites – Northeast (Jamie Shanley, USGS): This session will highlight sensor science from three research sites in the northeast.
9:20 NE1: Pat McHale — Huntington Forest, NY
9:30 NE2 Dave Hollinger – Howland, Bartlett, and other sites
9:40 NE3: Wil Wollheim – Ipswich River, Plum Island LTER
9:50 Sensor Sites: LTER (Corinna Gries, University of Wisconsin-Madison): This session will highlight sensor science from three LTER research sites.
9:55 LTER1: Don Henshaw – Andrews Experimental Forest
10:05 LTER2: John Porter – Virginia Coast Reserve
10:15 LTER3: Corinna Gries – North Temperate Lakes
10:25 Break
10:45 Sensor Networks (Pete Murdoch, USGS): This session will present overviews of established networks of sensor sites
10:50 NEON -Jeff Taylor
11:10 CUAHSI - Rick Hooper
11:30 USGS and multi-agency collaborations – Pete Murdoch
11:50 Discussion: Overarching discussion on barriers and opportunities
12:30 Lunch
1:30 Sensor Science (Lindsey Rustad, USFS) – This session will highlight novel research discoveries and directions based on environmental sensors.
1:35 Talk 1: Emery Boose --Harvard Forest
1:45 Talk 2: Dan Dickinson – Florida Coastal Everglades
1:55 Talk 3: Lindsey Rustad – “Synthesis of survey results” and NERC regional examples
2:05 Discussion
3:00 Break
3:30 Optional Field Trip: Hubbard Brook RealTime System (Nick Grant, Ian Halm, Amey Bailey, Lindsey Rustad)
5:30 Free Time/Mixer
6:30 Dinner
7:30 Posters/Discussions

Wednesday – October 26
8:00 Continental Breakfast at Pierce Lab
9:00 Software and Technology Outlook for Managing Sensor Data (John Porter, University of Virginia) – This session will highlight advances and new developments in data access and delivery.
9:05 Talk 1: Mikhail Nekrosov (DataTurbine)
9:30 Talk 2: Jeff Taylor (NEON)
9:55 Group Discussion
10:30 Break
10:45 Breakout Discussion Groups: Discussion leaders, John Campbell, Alene Onion, John Porter
12:30 Lunch
1:30 Streaming QA/QC (Don Henshaw, Oregon State University) - This session will highlight advances and new developments in streaming QA/QC.
1:35 Talk 1: Derik Barseghian (NCEAS/REAP)
2:00 Talk 2: Wade Sheldon (GCE)
2:25 Group Discussion
2:50 Break
3:05 Breakout Discussion Groups Discussion leaders, Wade Sheldon, Christine Laney, Ethan Dereszynski
5:00 Free Time/Posters/Mixer
6:30 Dinner
7:30 Separate discussions: LTER SensorNIS Next Steps Discussion NERC Northeast Environmental Sensor Next Steps Discussion

Thursday – October 27
8:00 Continental breakfast
8:30 Discussion Group Reports
9:00 Product-oriented discussion and activities – potential publications or white papers regarding recommendations for access, delivery, QA/QC, and archival of streaming data

11:30 Plenary Discussion and Wrap-up
12:00 Lunch and Adjourn

Participants

First Name	Last Name	Group
John	Anderson	LTER
Amey	Bailey	HBR Local
Derik	Barseghian	NCEAS
Adam	Baumann	NERC
Bridget	Benson	NERC
Emery	Boose	LTER
John	Campbell	HBR Local
Richard	Cary	LTER
Jon	Chappell	NERC
Brian	Charlton	LTER
Alix	Contosta	NERC
Irena	Creed	NERC
Joe	Davis	LTER
Ethan	Dereszynski	LTER
Dan	Dickinson	LTER
Jason	Downing	LTER
Chris	Duffy	NERC
Rick	Edwards	USFS
Bob	Evans	NERC-day
Tom	Faber	NERC
Ivan	Fernandez	NERC-day
Stuart	Findley	UNK
Inke	Forbrich	LTER
Guin	Fredriksen	NERC
Stuart	Gaffin	UNK
M.	Gastil-Buhl	LTER
Nick	Grant	HBR Local
Corinna	Gries	LTER
Ian	Halm	HBR Local
Greg	Hellyer	NERC
Don	Henshaw	LTER
Dave	Hollinger	NERC-day
Rick	Hooper	CUAHSI
Hope	Humphries	LTER
Christine	Laney	LTER
Stephanie	Laseter	LTER
Jim	Laundre	LTER
Mary	Martin	HBR Local

Pat	McHale	NERC
Eda	Melendez-Colom	LTER
Geoff	Millard	NERC
Rakesh	Minocha	NERC
Mathew	Munson	nerc
Peter	Murdoch	NERC
Micheal	Nekrosov	DataTurbine
Bob	Newton	NERC
Troy	Ocheltree	LTER
Alene	Onion	NERRS
John	Porter	LTER
Linda	Powell	LTER
Alison	Price	NERC
Ken	Ramsey	LTER
Kevin	Rose	NERC
Mark	Rudnicki	NERC
Lindsey	Rustad	NERC
Inigo	San Gil	LTER
Bill	Schuster	NERC
Jamie	Shanley	NERC
Wade	Sheldon	LTER
Chris	Skalka	NERC
Adam	Skibbe	LTER
Bob	Smith	HBR Local
Shannon	Sterling	NERC
Jeff	Taylor	NEON
Skip	Van Bloem	LTER
John	Vande Castle	LTER
Kristin	Vanderbilt	LTER
Tom	Villars	NERC-day
Jonathan	Walsh	LTER
Kristen	Whitbeck	NERC
Craig	Williamson	NERC
Wil	Wolheim	NERC

Presentations

Sensor Sites – Northeast
Pat McHale — Huntington Forest, NY
Dave Hollinger – Howland, Bartlett, and other sites
Wil Wollheim – Ipswich River, Plum Island LTER

Sensor Sites: LTER
Don Henshaw – Andrews Experimental Forest [14]
John Porter – Virginia Coast Reserve
Corinna Gries – North Temperate Lakes [15]

Sensor Networks
NEON -Jeff Taylor

CUAHSI - Rick Hooper
USGS and multi-agency collaborations – Pete Murdoch

Sensor Science
Emery Boose --Harvard Forest
Dan Dickinson – Florida Coastal Everglades
Lindsey Rustad – “Synthesis of survey results” and NERC regional examples

Software and Technology Outlook for Managing Sensor Data
Mikhail Nekrosov (DataTurbine)
Jeff Taylor (NEON)

Streaming QA/QC
Derik Barseghian (NCEAS/REAP)
Wade Sheldon (GCE)

Workshop Notes

Overall Meeting Notes
Notes from Jonathan Walsh [16]
Notes from John Porter [17]

Presentation/discussion notes
Notes from Gastil (Tuesday morning presentations) [18]
Notes from Gastil (Tuesday afternoon presentations) [19]
Notes from Corinna (Tuesday afternoon discussion) [20]
Notes from Gastil (Wednesday morning presentations) [21]
Notes from Alene Onion (Technology Group 3) [22]
Notes from Gastil (Wednesday afternoon presentations) [23]
Notes from Gastil (QA/QC Group 1) [24]
Notes from Corinna (QA/QC Group 2) [25]
Notes from John Porter (QA/QC Group 3) [26]

Wednesday Morning Technology Breakout Discussion Groups
Group 1 Report (Mary Martin)
Group 2 Report (John Campbell) [27]
Group 3 Report (Alene Onion) [28]

Wednesday Afternoon QA/QC Breakout Discussion Groups
Group 1 Report (Wade Sheldon) [29]
Group 2 Report (Christine Laney) [30]
Group 3 Report (Ethan Derezynski) [31]

Wednesday Evening Breakout Discussion Groups
LTER SensorNIS [32]
Next Steps Discussion NERC

Thursday Morning Breakout Discussion Groups
Knowledge Base (Jamie Shanley) [33]
Campbell publication (John Campbell) [34]
Data Levels/Qualifiers (Don Henshaw) [35]
Sensor Management System (John Porter) [36]

Sensor management best practices workshop, September 4 - 6, 2013

Workshop participants:
In-person:
Don Henshaw (AND)
Corinna Gries (NTL)
Renee Brown (SEV)
Chris Jones (DataONE)
Scotty Strachan (Univ of Nevada-Reno)
Adam Kennedy (AND)

Logistics
Our lodging is in Quartz Creek building (lower left apartment). The door code to the apartment is 6-0-2-6, and the code for the

office for after hour use is 2-5-1. We have the library reserved inside the office building.

Note: there is limited or no cell phone reception at the Andrews. There is wi-fi in all of the apartments and open areas. There is also a public telephone for use. The general receptionist phone number is 541-822-6300.

Agenda

Wednesday Sept 4, 2013	
Time	**Activity**
3:00 pm - 9:00 pm	Arrivals
6:00 pm - 9:00 pm	Catered dinner at our discretion
Thursday Sept 5, 2013	
7:30 am - 8:30 am	Catered breakfast
8:30 am - 11:00 am	Organization and planning discussion
11:00 am - 12:00 pm	Breakout for individual section development / remote vtc
12:00 pm - 2:30 pm	Box lunch / field trip to sensor sites
3:00 pm - 5:30 pm	Breakout for individual section development
5:30 pm - 6:30 pm	Happy hour
6:30 pm - 7:30 pm	Catered dinner
7:30 pm - 9:00 pm	Discussion
Friday Sept 6, 2013	
7:30 am - 8:30 am	Catered breakfast
8:30 am - 11:00 am	Reporting, schedule next steps and document postings
11:00 am - 12:00 pm	WebEx with remote participants
12:00 pm - 1:00pm	Box lunch
1:00 pm	Early departures/ continue work or adjourn

Related Links

- Driving directions to the Andrews (682) [37]

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Any opinions, findings, conclusions, or recommendations expressed in the material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Please contact us with questions, comments, or for technical assistance regarding this web site.

Source URL: http://im.lternet.edu/projects/SensorNIS

Links:
[1] http://im.lternet.edu/sites/im.lternet.edu/files/sensor_training_28May_VWC.pdf
[2] http://im.lternet.edu/node/1148
[3] http://im.lternet.edu/sites/im.lternet.edu/files/data_quality_level.pdf
[4] http://intranet2.lternet.edu/sites/intranet2.lternet.edu/files/documents/Scientific%20Reports/Climate%20and%20Hydrology%20Database%20Projects/Climstan99.pdf
[5] http://im.lternet.edu/node/1152
[6] http://im.lternet.edu/node/1153
[7] http://wiki.esipfed.org/index.php/EnviroSensing_Cluster
[8] http://im.lternet.edu/node/954
[9] http://asm2012.lternet.edu/sites/default/files/Workshop_report_sensorNIS.pdf
[10] http://im.lternet.edu/sites/im.lternet.edu/files/Sensor_best_practices_20Mar2013_1.pdf
[11] https://im.lternet.edu/node/1110
[12] https://www.surveymonkey.com/s/Environmental_Sensor_Technology
[13] http://im.lternet.edu/sites/im.lternet.edu/files/SurveySummary_11222011.pdf
[14] http://im.lternet.edu/sites/im.lternet.edu/files/SensorNISHenshaw.pdf
[15] http://im.lternet.edu/sites/im.lternet.edu/files/SensorNISGries.pdf
[16] http://im.lternet.edu/sites/im.lternet.edu/files/JonathanWalshNotes.docx
[17] http://im.lternet.edu/sites/im.lternet.edu/files/Porter_SensorNIS2011_final.pdf
[18] http://im.lternet.edu/sites/im.lternet.edu/files/SensorNIS_25Oct2011_AM_SiteExamples.txt
[19] http://im.lternet.edu/sites/im.lternet.edu/files/SEnsorNIS_25Oct2011_PM_SensorScience.txt
[20] http://im.lternet.edu/sites/im.lternet.edu/files/Tuesday_PM_session2_discussion.pdf
[21] http://im.lternet.edu/sites/im.lternet.edu/files/Weds_AM_notes_SensorNIS_26Oct2011.txt
[22] http://im.lternet.edu/sites/im.lternet.edu/files/Wed_AM_Onion_Price_group3.pdf

[23] http://im.lternet.edu/sites/im.lternet.edu/files/Weds_PM_notes.txt
[24] http://im.lternet.edu/sites/im.lternet.edu/files/Weds_PM_Breakout_QC_notes.txt
[25] http://im.lternet.edu/sites/im.lternet.edu/files/notesqaqc_group2_wedpm_corinna.pdf
[26] http://im.lternet.edu/sites/im.lternet.edu/files/QAQC working group 3.pdf
[27] http://im.lternet.edu/sites/im.lternet.edu/files/technology group 2.pdf
[28] http://im.lternet.edu/sites/im.lternet.edu/files/technology Group 3.pdf
[29] http://im.lternet.edu/sites/im.lternet.edu/files/QC Group 1.pdf
[30] http://im.lternet.edu/sites/im.lternet.edu/files/QC Group 2.pdf
[31] http://im.lternet.edu/sites/im.lternet.edu/files/QC group 3.pdf
[32] http://im.lternet.edu/sites/im.lternet.edu/files/LTERSensorNIS2011_wednite_porter.pdf
[33] http://im.lternet.edu/sites/im.lternet.edu/files/Knowledge base group 1.pdf
[34] http://im.lternet.edu/sites/im.lternet.edu/files/Campbell Paper.pdf
[35] http://im.lternet.edu/sites/im.lternet.edu/files/DataLevels_BreakoutReport_20111027.pdf
[36] http://im.lternet.edu/sites/im.lternet.edu/files/Thursday AM Sensor Management.pdf
[37] http://im.lternet.edu/links/goto/1220/171/links_related