



National Snow and Ice Data Center
Supporting Cryospheric Research Since 1976



Review of Polar Data Community Activities

Peter L. Pulsifer
 National Snow and Ice Data Center
 University of Colorado Boulder



ARCTICDATA COMMITTEE



Goals and Objectives of the Polar Data Planning Summit



The Vision

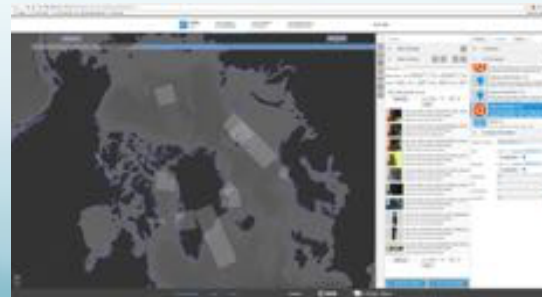
- “Common access, Single Window” to discuss and access data through information technology
- High quality, ethically open data preserved over time (sustainability)
- Data as a service
- Interoperability (share data among various information systems in a useful and meaningful manner)
- Inclusive of Indigenous and local perspectives
- Access to big data and powerful analytical tools (e.g. cloud platforms)
- Cost effective!



<http://nsidc.org/acadis/search/>



Pulsifer xxet al. 2014



Screen capture complements of Polar View



<http://eloka-arctic.org/communities/yupik/atlas/index.html>

PDPS

- Bring polar data coordinating bodies and other interested orgs and people together
- Provide a space for detailed technical discussion and architecture-level planning
- Establish a plan for community focus areas and future coordination

Recent History of Polar Data

Arctic Data: Opportunities, Challenges and the Way Forward

See <http://arcticdc.org/meetings/adc-meetings/interoperability-workshop> for links to resources

Glaciological Data Report GD-33 May 2006

International Polar Year Data Management Workshop, 3-4 March 2006



Planning the legacy of IPY 2007-2008



National Snow and Ice Data Center
World Data Center for Glaciology, Boulder



3 Canadian Cryosphere
4 CEN: Centre d'Etud
5 NICZ Royal Netherl



POLAR CONNECTIONS

REPORT OF THE POLAR CONNECTIONS
INTEROPERABILITY WORKSHOP AND
ASSESSMENT PROCESS

7-10 NOVEMBER 2016

Editors: Peter L. Pulsifer, Julie Fridell, Pip Bricher, Øystein Godoy, Colleen Strambacker, David Arthurs, Lynn Yarmey, Andrew Fleming



[DRAFT]

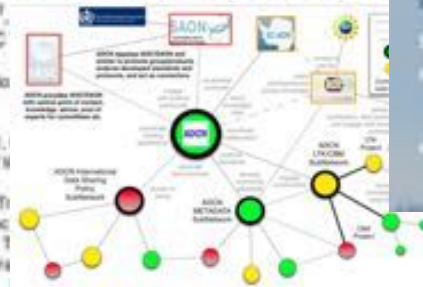
FINAL POLAR D...

J. Fridell,
Nickels, C.

University of Colorado

Mohr, J. L.,
University of N

Arctic Institute, T.
University, Quebec
research, Texas, U
University of Colora



Taco



Open Geospatial Consor

Request for Information

Arctic Spatial Data



Workshop on Arctic Data Coordination at IPY 2012, Montreal



Statement of Principles and Practices for Arctic Data Management
April 16, 2013

All NSIDC endorsed scientific results shall be verifiable and reproducible through ethically open access to all data necessary to produce those results. Data shall be preserved, accessible, and used in accordance with scientific norms of fair attribution and use.

To this end, IASC Council approves the following actions:

1. Endorsement of the Statement of Principles and Practices for Arctic Data

Opportunities

Data is Big

White House blog post titled "The White House Names Dr. DJ Patil as the First U.S. Chief Data Scientist". The article is dated February 18, 2015, and is written by Megan Smith. The summary states: "Dr. DJ Patil is joining us as Deputy Chief Technology Officer for Data Policy and Chief Data Scientist in the White House Office of Science and Technology Policy."

EDGI report titled "Protecting Climate Data in Times of Political Turmoil - A Report from Los Angeles". The report is dated January 21, 2017, and is authored by the Southern California Climate Data Protection Project. The page includes a search bar, navigation links, and a sidebar with a "Support the EDGI" section and a "Sign Up Newsletter" form.

OpenAire website page titled "What is the Open Research Data Pilot". The page features a header with the OpenAire logo and navigation links. The main content area includes a large image of a tree and text describing the pilot program. A sidebar on the right contains a "Latest News" section with a link to "Webinar W30: An Introduction to the DSA-4000 Common Requirements".

Google search results for "big data". The search results show a page 2 of about 2,000,000 results. The top result is a news article titled "Can big data help improve wellness programs?" from Employee Benefit News, dated 18 hours ago. The article discusses the challenges of maintaining wellness programs in the face of growing adoption and investment. Below the article is a small image of a blue, glowing, abstract shape.

<https://obamawhitehouse.archives.gov/blog/2015/02/18/white-house-names-dr-dj-patil-first-us-chief-data-scientist>

<https://www.openaire.eu/opendatapilot>

<https://www.icsu-wds.org/>

<https://www.rd-alliance.org/>

<https://envirodatagov.org/protecting-climate-data-in-times-of-political-turmoil-a-report-from-los-angeles/>

Observations, Data and Societal Benefit

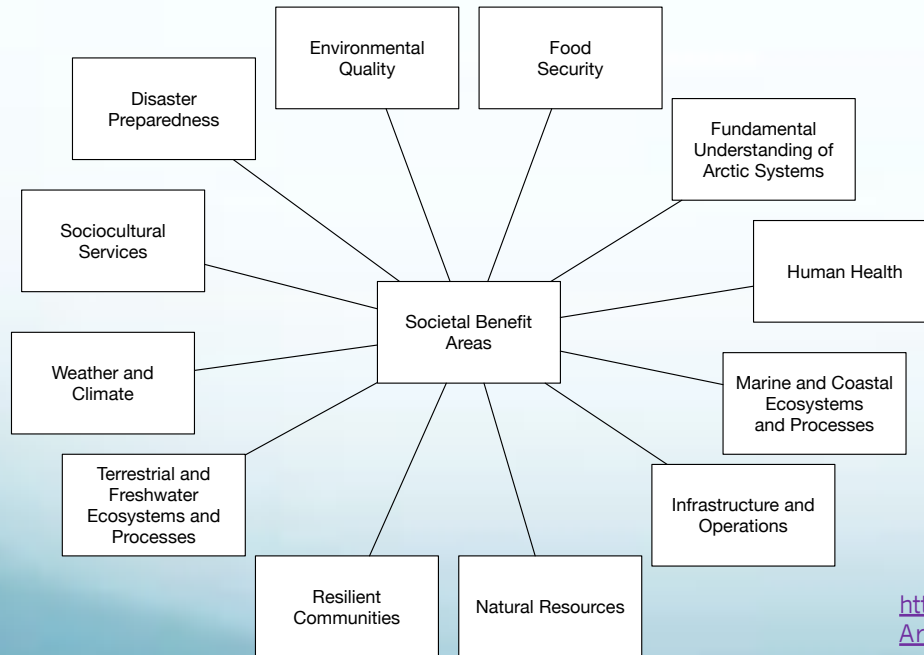
Proposal by Finland for a new project:

Arctic Observation Value project - assessment for physical atmospheric and oceanic variables

Background and Motivation

Arctic monitoring is largely not sustained for a long term. The first [Arctic Science Ministerial declaration](#) and the Arctic Council's [Fairbanks declaration](#) are calling for [increased efforts to observe the Arctic](#). An initiative within SAON (Sustaining Arctic Observing Networks) has recently been started and is trying to clearly justify Arctic-monitoring actions by performing a comprehensive Arctic Observation Systems value tree analysis. The Assessment framework and top of the tree has been developed by a workshop in January. The [corresponding report](#) is published on the SAON web. This work has only been started and needs now the next step. Sustaining and extending the Arctic Observing system becomes easier if the value of observations can be made more explicit. It also helps to focus efforts on areas with most impact for policy goals. For this value tree to reach the lower level, it needs to be assessed from the bottom up connecting the information produced for key societal objectives to the underlying services and observation data sources.

Sustainability is a key concept



<https://www.arcticobserving.org/images/pdf/misc/STPI-SAON-International-Arctic-Observations-Framework-Report-2017.pdf>

Arctic Science Ministerial

White House Arctic Science Ministerial: September 28, 2016

Event on 2016-09-28, 09:00:00 of date is obsolete

Summary: On September 28, 2016, science ministers from across the globe will gather in Washington, DC, for the first-ever White House Arctic Science Ministerial.

Understanding the rapid changes that are affecting the Arctic – as well as the impacts of these changes on the rest of the world – requires a cooperative, global approach based on research partnerships involving participants from Arctic and non-Arctic nations, including, of course, the people who call the Arctic home. That's why, on September 28, 2016 – just after the one-year anniversary of President Obama's historic visit to Alaska – the Administration will host the first-ever Arctic Science Ministerial.

The White House Arctic Science Ministerial will bring together ministers of science, chief science advisors, and other high-level officials from countries around the world, as well as representatives from indigenous groups, to expand joint collaborations focused on Arctic science, research, observations, monitoring, and data-sharing. The

European Commission | Research and Innovation |

Second Arctic Science Ministerial

Berlin, Germany

Second Arctic Science Ministerial

16-18 October 2016, Berlin, Germany

[Add to calendar](#) [Go to the main events calendar to see all forthcoming events](#)

[Share](#) The European Commission, Finland and Germany will co-host the 2nd Arctic Science Ministerial (ASMin) on 16-18 October 2016 in Berlin.

News Events - most recently added events appear first in this feed. There is also a feed for past events.

There are lots more events in the area of **Arctic Science** - see [the ASMin calendar](#).

[Suggest an event](#)

Polar Orgs & Cyberinfrastructure

- Arctic Data Committee
- SCADM
- SOOS
- GCW
- GEOCRI
- AC WGs
- Arctic SDI
- Polar View
- ...

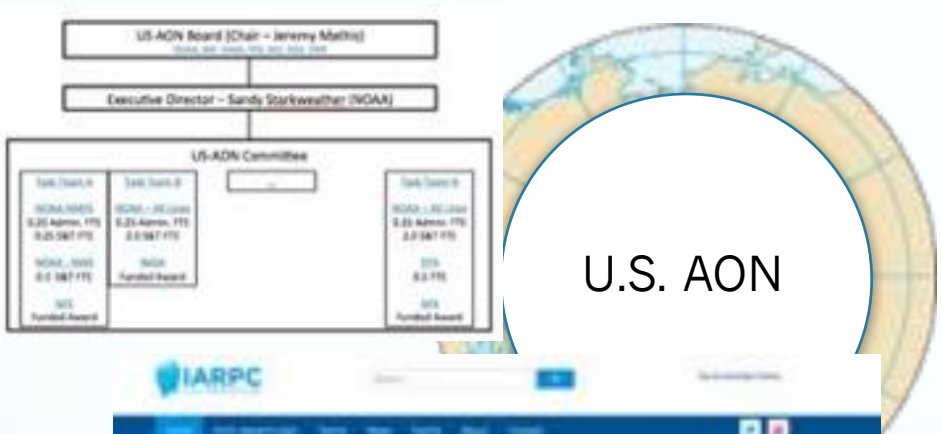


Montreal 16-18 Sept. 2017



<https://www.rd-alliance.org/plenaries/rda-tenth-plenary-meeting-montreal>

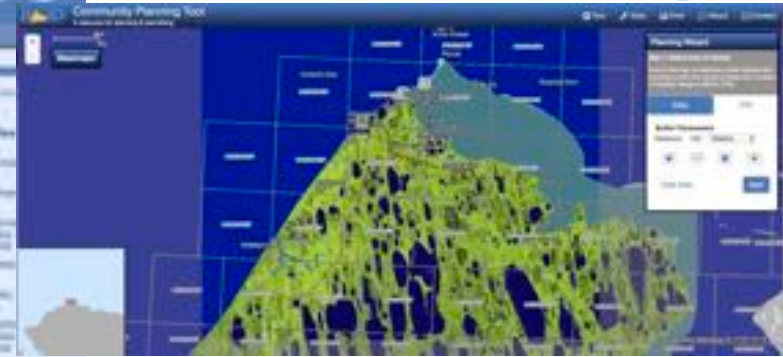
National/Regional Hubs



The Canadian Consortium for Arctic Data Interoperability



Local Community Hubs and Nodes



dataARC



<http://www.arcticcbm.org/index.html>

<http://www.inuitknowledge.ca/>

<https://toolkit.climate.gov/tool/atlas-community-based-monitoring-and-traditional-knowledge-changing-arctic>

<http://ittaq.ca/>

<http://prodgis02.utep.edu/BaidCommunityPlanningTool>

<http://www.inuitcircumpolar.com/community-based-monitoring.html>

Community Driven Monitoring Workshop, Québec

- Interest in building bottom-up networks
- Investment in community capacity and infrastructure needed
- Interoperability across technical platforms
- Major issues around data sharing are social/ political rather than technical

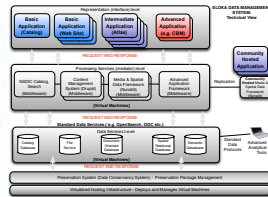


Workshop on Community Based Monitoring held at Arctic Change, 11,12 December



Indigenous and Community-Based Data/Information Platforms

<http://eloka-arctic.org/>



<http://nunaliit.org/>



<https://www.smartice.org/>



<https://www.leonetwork.org>



<https://arcticeider.com/siku>



<http://trailmarksys.com/>



<https://enuk.eco/>



<http://ittaq.ca/>

Global Cyberinfrastructure & Orgs

- WMO
- GEO
- GOOS, IODE
- ...
- RDA
- WDS
- CODATA
- IODE (SeaData(Net)CI)

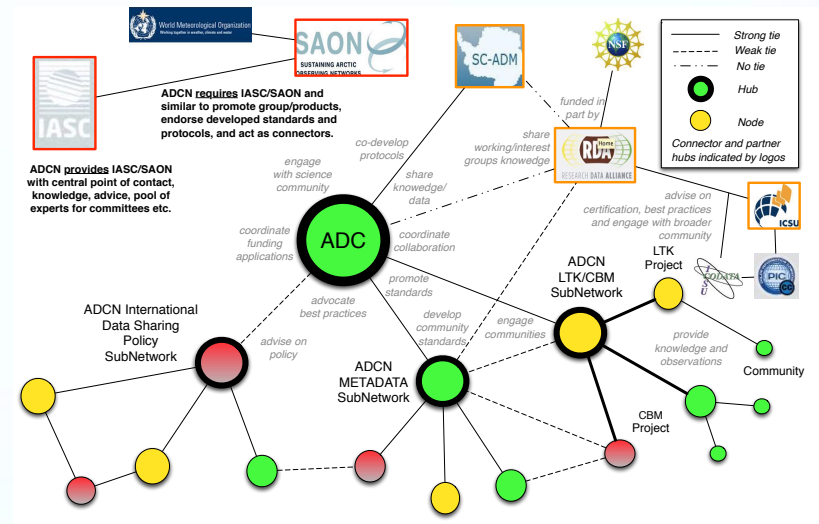


Selected Recent Developments

Mapping the Data Ecosystem

Network Systems Science and the Need for a Distributed System

- Need to guide the design of a robust network that achieves the Vision – pragmatic, Agile
- Robust networks include **multiple *hubs*** and less connected nodes – “loose ties” + “hub and spoke



Pulsifer, P. L., Yarmey, L., Godøy, Ø. et al. (2014). Towards an International Polar Data Coordination Network. *Data Science Journal*, 13, 94–102. doi:<http://dx.doi.org/10.2481/dsj.IFPDA-16>

Mapping and Understanding the Data Ecosystem

Title: Postdoctoral Fellow (Arctic Data e-Coystem Scientist)
 Reports to: Professor Paul Arthur Berkman and Dr. Peter Pulsifer
 Location: Fletcher School of Law and Diplomacy, Tufts University
 FTE: 12 Months (with possible extension)

POSTDOCTORAL FELLOW
 Arctic Data e-Coystem Scientist

BACKGROUND OF FLETCHER SCHOOL OF LAW AND DIPLOMACY AT TUFTS UNIVERSITY

The Fletcher School is committed to educating in an inclusive and supportive environment that welcomes students regardless of national origin, religion or citizenship status. At The Fletcher School, for more than 80 years, we have had to "know the world." Our job is to prepare our graduates to be practitioners in every dimension of international relations, economics, finance, diplomatic history, politics, culture, security and many other disciplines. The challenges we face in this turbulent 21st century quite literally transcend borders - no one must be ready to connect in every sense of the word.



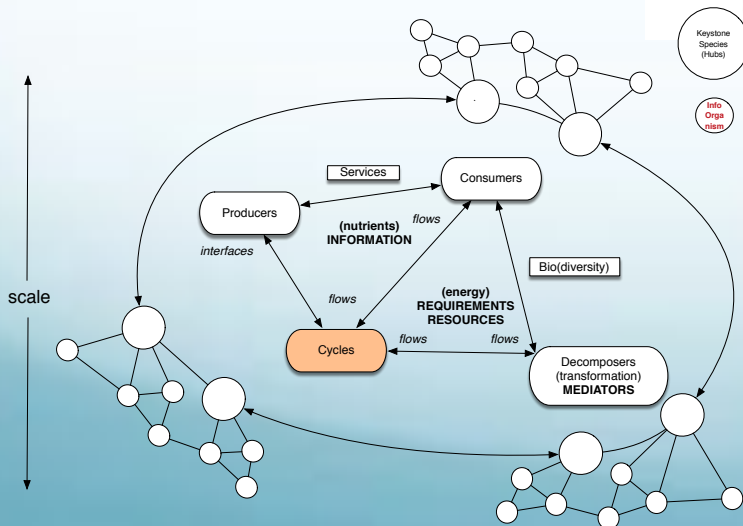
Dr. Katia Kontar

Information Ecology to Map the Arctic Information Landscape

Peter L. Pulsifer, Yekaterina Kontar, Paul Arthur Berkman, D.R. Fraser Taylor

12.1 Introduction

Governance involves processes of interaction, dialogue, negotiation and decision-making among many actors involved in the development of social norms and institutions. Understanding and addressing the values, key priorities, and common interests of actors is critical to effective governance that balances societal well-being, environmental protection and economic prosperity across generations. This is particularly challenging in the Arctic region due to the complexity of the region in the face of significant environmental, economic



Arctic Data Ecosystem Map (ADWAF)

The objective of this article is to establish a map of the Arctic data management 'ecosystem' or 'landscape'. This is both a concept map including purposes, interests and relationships as well as a geographic map including location. The effort was started during the first meeting of the ADC in Potsdam, Germany, November 2010 and is an ongoing activity. The meeting for this project included considering a shared open data and open the software people to access the database (i.e. using SPARQL).

In June 2010, the concept of mapping the Arctic data ecosystem was presented to each leg: Peter Pulsifer, the second meeting of the steering group (held in the Arctic region) led by Professor Paul Berkman. Similar concepts were being discussed by the Inter-Agency System team and other initiatives under-organizations such as the Research Data Alliance (RDA) were being developed. Starting in early 2011, this activity is now being carried out using resources from and under a license provided by the Inter-Agency System project in collaboration with a number of other data and policy related initiatives. Results will be posted here and elsewhere.

Preliminary Map



A group like IARPC in the U.S. has its own data ecosystem

From Map to Model



Underlying Database - LOD

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## NASA
<4547a1d0-1d00-4216-abcb-ef5cb1cc8783>
  rdfs:type org:OrganizationalUnit ;
  rdfs:label "NASA" ;
  rdfs:comment "National Aeronautics and Space Administration (NASA)";
  foaf:homepage <https://www.nasa.gov/> ;
  org:hasPrimarySite <4547a1d0-1d00-4216-abcb-ef5cb1cc8783.site> ;
  org:classification pdes:classification:governmentAgency
  org:unitOf <378aac00-acc2-4cd7-a027-b8a621f88f1e> ;
  pdes:fundedBy <378aac00-acc2-4cd7-a027-b8a621f88f1e> .

<4547a1d0-1d00-4216-abcb-ef5cb1cc8783.site>
  a org:Site ;
  org:siteAddress <4547a1d0-1d00-4216-abcb-ef5cb1cc8783.site.org>

<4547a1d0-1d00-4216-abcb-ef5cb1cc8783.site.org>
  a xcard:Address ;
  xcard:country-name "United States" ;
  xcard:postal-code "20540" ;
  xcard:region "District of Columbia" ;
  xcard:locality "Washington" ;
  xcard:street-address "300 E. Street SW, Suite 5R30" .

## NSIDC
<d346e52c-3a64-43cc-9cc2-6b1e55df2304>
  rdfs:type org:Organization ;
  rdfs:label "NSIDC" ;
  rdfs:comment "National Snow and Ice Data Center (NSIDC)";
  foaf:homepage <https://nsidc.org/> ;
  org:classification pdes:classification:dataCenter ;
  org:hasPrimarySite <d346e52c-3a64-43cc-9cc2-6b1e55df2304> ;
  pdes:fundedBy <4547a1d0-1d00-4216-abcb-ef5cb1cc8783> ;
  org:memberOf <b121225c-cbfd-4db0-bfbc-edf8927723b5> ;
  pdes:fundedBy <2da7d57b-8afe-47ce-b829-3204a43a4c52> .

#Start definition of organization classification schema
<http://example.org/pdes-organization-classifications#>
  a skos:ConceptScheme;
  rdfs:isDefinedBy <http://example.org/pdes-organization-classifications#>;
  rdfs:label ""Polar Data Ecosystem Organization Classification Schema"";
  GCI:hasVersion ""0.0.1"" .

pdes:classification:networkOfNetworks
  a skos:Concept;
  skos:inScheme <http://example.org/pdes-organization-classifications#>;
  rdfs:label ""Network of Networks""@en.

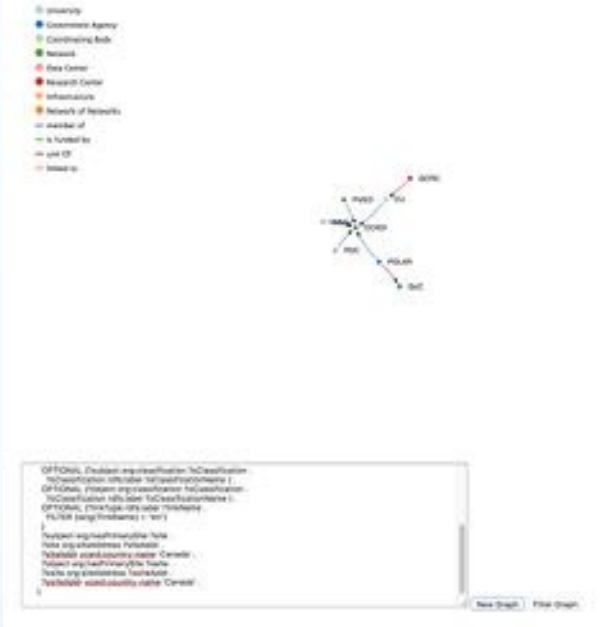
pdes:classification:systemOfSystems
  a skos:Concept;
  skos:inScheme <http://example.org/pdes-organization-classifications#>;
  rdfs:label ""System of Systems""@en.

pdes:classification:network
  a skos:Concept;
  skos:inScheme <http://example.org/pdes-organization-classifications#>;
  rdfs:label ""Network""@en.

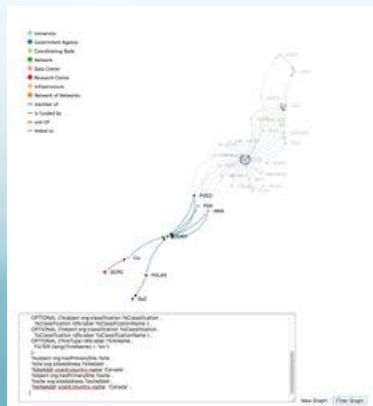
pdes:classification:infrastructure
  a skos:Concept;
  skos:inScheme <http://example.org/pdes-organization-classifications#>;
  rdfs:label ""Infrastructure""@en.

pdes:classification:dataCenter
  a skos:Concept;
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  rdfs:label ""Data Center""@en.
```

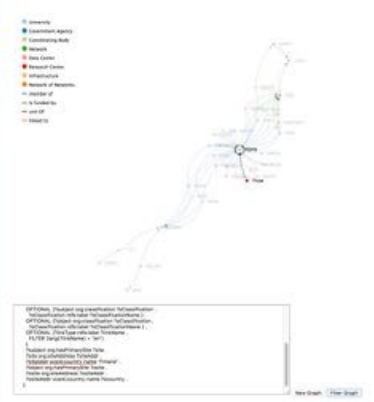

Dynamic Queries



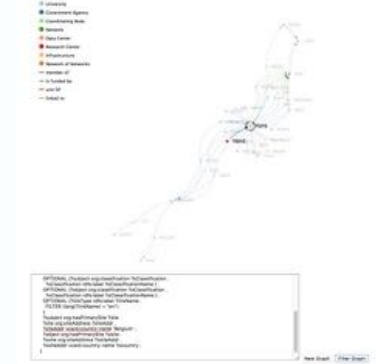
Canada



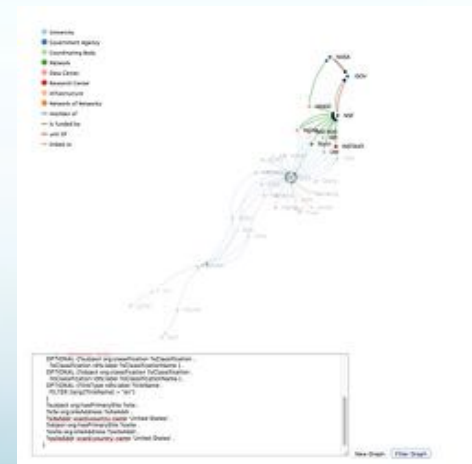
By Country



Finland

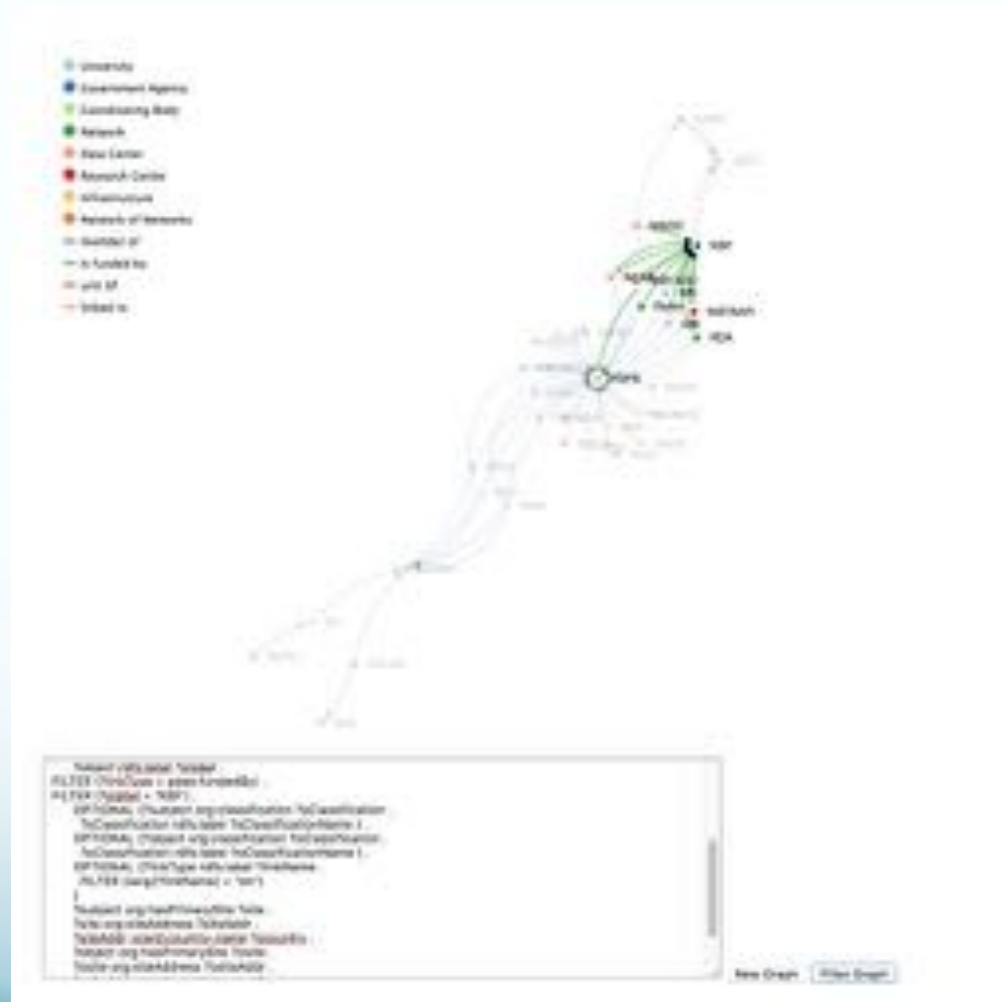


Belgium



USA

Funding Ecosystem



POLDER

Polar Federated Search Working Group

- Joint SOOS, ADC, SCADM, SOOS effort
- Major support from Arctic Portal, SOOS, RBINS, NSIDC/ELOKA and all partners
- Concrete products under development
- Early use of products by community
- Chaired by Bricher, Smirnov, De Bruin

Polar Federated Search Working Group Draft Terms of Reference

Mission Statement:

The Polar Federated Search Working Group (PFSWG) is a collaboration between the Arctic Data Committee(ADC), Standing Committee on Antarctic Data Management (SCADM), and Southern Ocean Observing System (SOOS), to develop the tools and resources to support metadata aggregation and federated search tools to improve the discoverability of polar science data.

Objectives:

- PFSWG will investigate the needs of the polar research community and opportunities for developing metadata aggregation and federated search
- PFSWG will advise ADC, SCADM, and SOOS on the best approaches to metadata aggregation federated search
- PFSWG will pursue funding and resource opportunities with other related groups to support metadata aggregation federated search
- Once funding/resources are found, PFSWG will act as a scientific advisory group for the developers
- PFSWG will maintain contact with the broader data management community to ensure that polar metadata aggregation and federated search is linked with other global initiatives and minimises duplication of efforts

Vocabularies and Semantics Working Group

ADC-USAPC-SCADM Vocabularies and Semantics Working Group

Pages
■ Archived: 21 Jul 2017

Group Summary

The vocabularies and semantics working group brings together people who are interested in semantic and vocabularies related to the arctic region. Originally established as a joint effort between the Arctic Data Committee and the Arctic Data and Data Users of the International Arctic Research Project Consortium, the group is open to all individuals and organizations with an interest in the topic.

Group mission include:

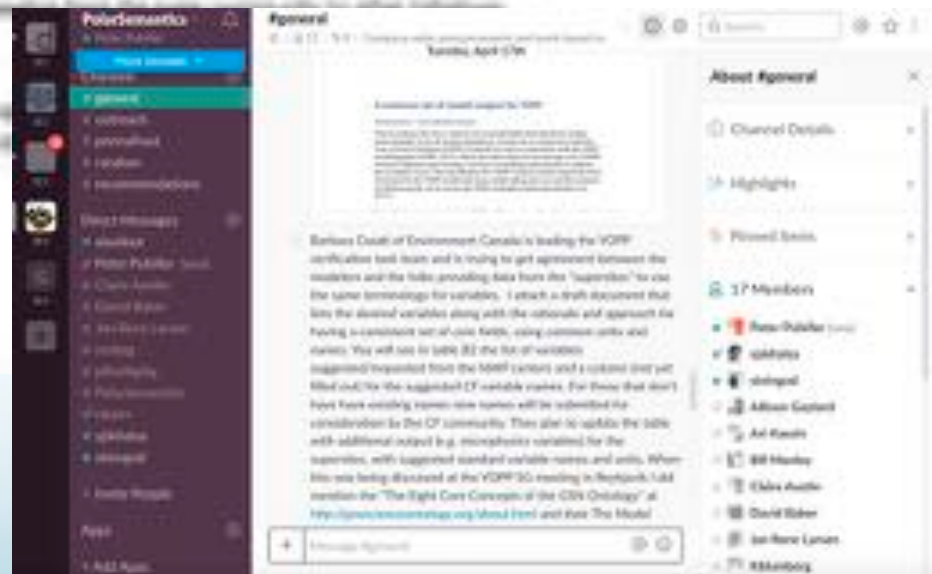
- Promote awareness of existing vocabularies and semantic resources to increase effectiveness and reduce or eliminate redundancy
- Coordinate vocabularies development activities across the user information community
- Develop and engage regular communication within the community
- Identify members of the community interested in data and information vocabularies
- Advise the user community about standard activities (e.g. ISO/TC46) and act as a witness to the work of other organizations

Status

The group is now active with regular virtual meetings using slack. As a general rule, the group meets on the first Tuesday of the month, held at what is administratively defined as UTC-7.

Meeting Minutes:

- 2014-08-17 (Scheduled)
- 2014-09-02 (Postponed from 2014-08-27, Minutes not approved yet)
- 2014-09-09



Chaired by Godøy & Duerr

<https://arcticdc.org/activities/core-projects/vocabularies-and-semantics-wg>

Indigenous Data

MEMBERSHIP

PUBLICATIONS

National Inuit Strategy On Research

2019-2024 National Inuit Strategy on Research

Approved by the Inuit Circumpolar Council (ICC) in 2019, the National Inuit Strategy on Research outlines the research agenda for Inuit communities and organizations. The strategy identifies areas for action to ensure that research is respectful and effective and that Inuit knowledge is valued and shared.

Figure 1: Respectful and beneficial research for all Inuit



Meetings



Where the Poles come together
A SCAR Biennial Conference
Davos, Switzerland
15-20 January 2018



XXXV SCAR Biennial Meetings

Arctic Science Summit Week 2018 & IASC Business Meetings



Arctic Observing Summit 2018

The Business Case of a pan-Arctic Observing System

Oslo, Scandinavia

24 - 26 June 2018

The Arctic Observing Summit (AOS) is a global consortium of governments, communities of local partners for the design, implementation, coordination and sustained operation of an international network of Arctic observing systems. The AOS provides a platform to address urgent and locally recognized needs of Arctic observing across all components of the Arctic system, to foster international partnerships, action and coordination of long-term observations aimed at improving understanding of and response and adaptation to system-wide Arctic change. It is an international forum for optimizing resources, dialogue through co-ordination of and exchange among researchers, indigenous organizations, the public, private and not-for-profit sectors, and all other stakeholders interested in the Arctic. The AOS is a contribution to the [Sustainable Arctic Observing Network](#) (Sustainable Arctic Observing Network) (SAON) and AOS.





ADC News & Events

Arctic Cleaning Summit, 14-15 June 2018, Geneva, Switzerland
17th ADC

Arctic 2018, 13-15 June 2018, Geneva, Switzerland
18th ADC

Arctic 2019, 12-14 January 2019, Tokyo, Japan
19th ADC



Arctic Data Committee Annual Meeting:
Geneva, Switzerland, November 2018

Gaborone, Botswana | 5-8 November 2018

INTERNATIONAL DATA WEEK
IDW 2018

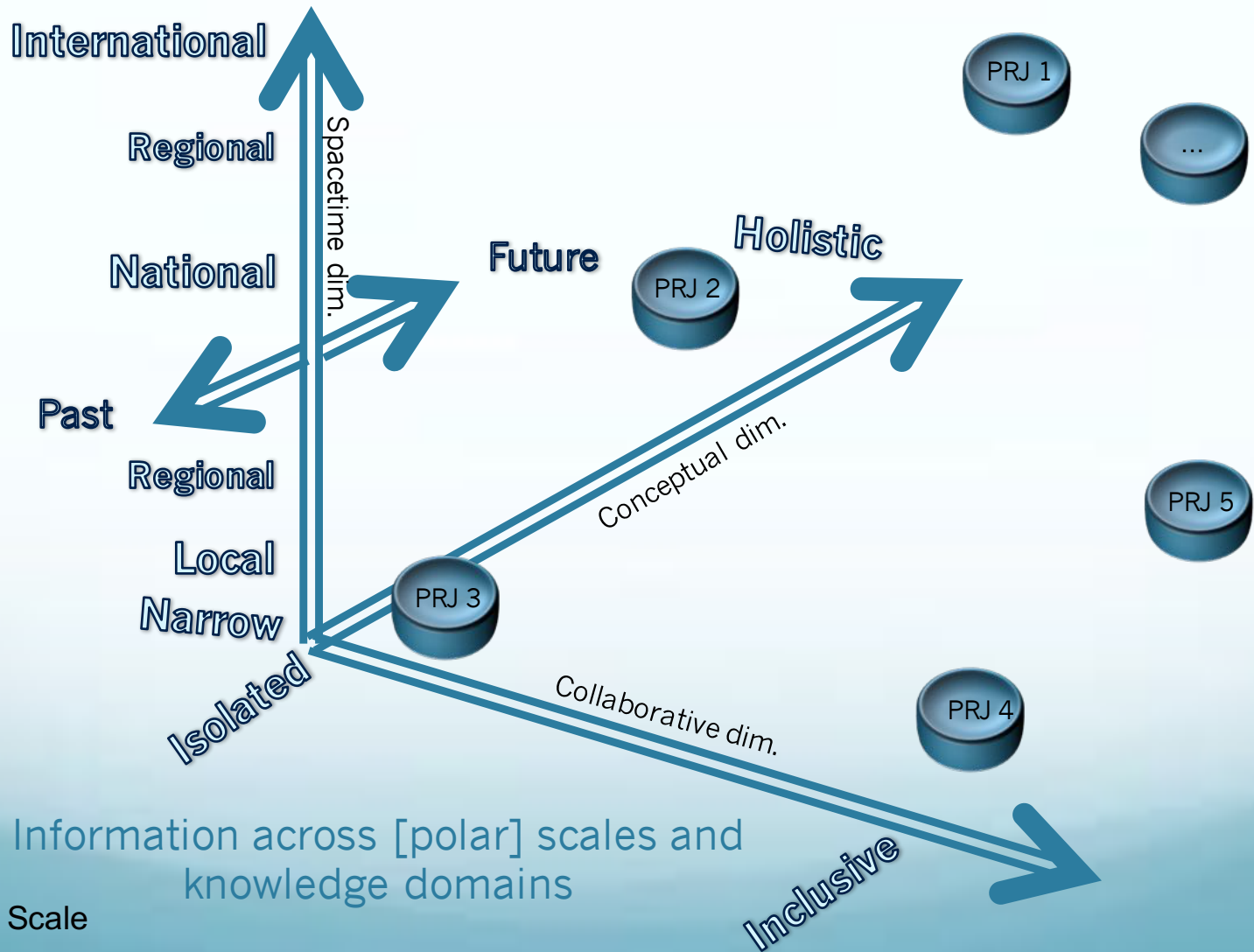


Arctic Science Ministerial

The screenshot shows the top navigation bar of the European Commission website. On the left is the European Union flag. In the center, there is a language selector set to 'English' with a flag icon. To the right is a search bar with the text 'Search' and a search button. Below the navigation bar is a dark blue header section with the text 'European Commission > Research and Innovation >' in a smaller font. The main title 'Second Arctic Science Ministerial' is displayed in large white font, with 'Berlin, Germany' written below it in a smaller white font. The main content area is divided into two columns. The left column features a section titled 'Second Arctic Science Ministerial' with a sub-header '19-20 October 2018, Berlin, Germany'. Below this is a 'Full Access or Catalogue' button and a link to 'Go to the main events catalogue to see all forthcoming events'. A 'Share' button is also visible. The right column contains a 'View Events' section with a sub-header 'most recently added events appear first in this feed. There is also a feed for past events.' Below this is a paragraph: 'There are lots more events in the area of materials (as presented on the [EMM catalogue](#))' and a 'Suggest an event' link.

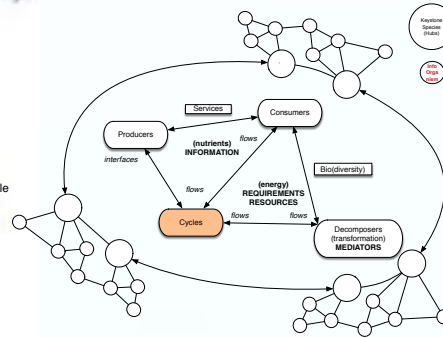
Challenges

Domain Complexity



Socio-Technical Model Complexity

Cyberinfrastructure Framework for the 21st Century



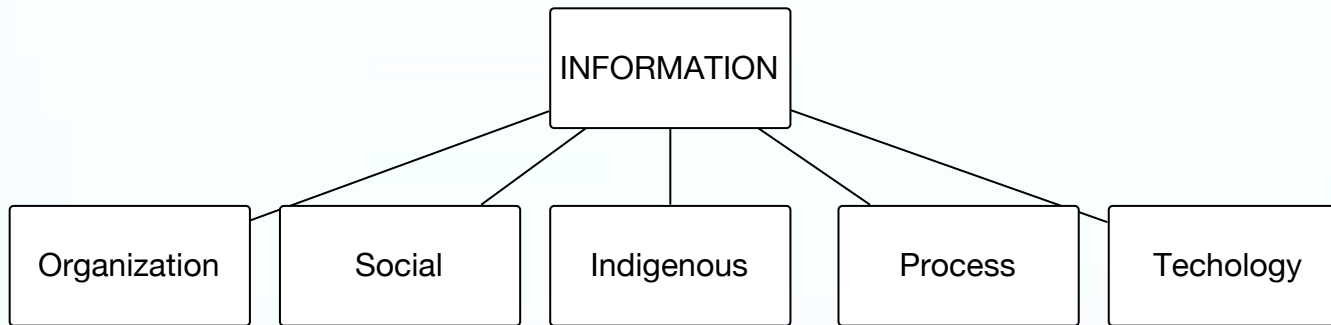
User Centered Design



Stanford d.school Design Thinking Process



Frames



DATA SCIENCE JOURNAL [Start Submission](#)

Proceedings Papers

Is Data Publication the Right Metaphor?

Authors: M.A. Parsons, P.A. Fox

Abstract

International attention to scientific data continues to grow. Opportunities emerge to re-visit long-standing approaches to managing data and to critically examine new capabilities. We describe the cognitive importance of metaphor. We describe several metaphors for managing, sharing, and stewarding data and examine their strengths and weaknesses. We particularly question the applicability of a "publication" approach to making data broadly available. Our preliminary conclusions are that no-one metaphor satisfies enough key data-systems attributes and that multiple metaphors need to co-exist in support of a healthy data ecosystem. We close with proposed research questions and a

Coordination Capacity

- Limited number of people in the community who are able, resourced, willing or qualified to lead or assist with coordination and management of complexity at a community scale

The Way Forward

Establishing Frames and Working Models



Learning from Robotics

Structure, Agency and Identity



Agency
"freedom"

Constrained
Freedom

Structure
"constraint"

Individual
identity

Funding

Collective
identity

"if all you have is a hammer,
everything looks like a nail"

Abraham Maslow's *The Psychology of Science*, published in 1966.

Attention

The image is a collage of several elements related to the concept of attention:

- Mobile Keyboard:** A blue and black keyboard is visible on the left side.
- Website Header:** A black header with the text "The Dumbest Post" and "Sign in" and "Log out" buttons is at the top.
- Mind Map:** A large, light blue mind map is the central focus. It features a central red node with two black nodes branching out to the left and right. The left side has a dense cluster of pink and white text nodes, while the right side has a more sparse structure of pink and white text nodes.
- Book Cover:** A book cover is visible on the right, with the author's name "Crawford" at the top and the title "L D O N D U R A D" in large letters. Below the title, it says "ON NEEDING TO INDIVIDUAL IN AN AGE OF DISTRACTION".
- Document Snippet:** A small snippet of a document is visible at the bottom right, containing the text "ON NEEDING TO INDIVIDUAL IN AN AGE OF DISTRACTION".

PDPS

- Priorities?
- Bottom Up vs. Top Down?
- Individual vs. Collective?
- Connection to other scales and “non-polar” organizations?
- Sustainability?

Day 1

- Examples of Cyberinfrastructures and Initiatives
- Setting the Context and Introduction to Use Cases
- Lightning talks