

Architecture References & Links, June 17, 2016

This is a companion document to the [EarthCube Architecture Workshop 2016 Final Report](#). This reference section organizes numerous materials considered before and during the workshop. Many of the links below are to copies of the materials collected in the [Architecture Workshop Library folder](#). Additional materials may be found in that folder; not all are cited here. Permlink to this document: <http://earthcube.org/document/2016/archws2016-finalreport>

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EarthCube Governance

- [EarthCube Strategic Vision](#) (May 2015)
- [EarthCube Charter](#) (May 2015)
- All [EarthCube Governance docs](#)
- [EarthCube Committees and Teams](#)
- [Council of Data Facilities](#) and [Registry Survey](#)
 - Category A: NSF-funded not-for-profit or academic data facilities
 - Category B: Federally Funded Research and Development Centers (FFRDCs) and other federal, state, and local data facilities.
 - Data facilities and centers operated by NASA, NOAA, USGS, and other U.S. federal, state, and local agencies.
 - Category C: International, private, and other not-for-profit or academic data facilities..
 - Data facilities and centers with a substantial portion of their funding and mission associated with international agencies, private foundations, or other sources.
 - Category D: Associate members
 - Professional associations, publishers, commercial entities, foundations, and consortia in the geosciences, cyber sciences, informatics, and related domains; and individuals not affiliated with a data facility, but supportive of the Council.
- [EarthCube Reverse Site Visit, Feb 2016 - Final Report](#)

EarthCube Architecture Workshop 2016: Architecture References (June 16, 2016)

- 44 ○ Section 2.1 Recommendation 2: “Articulate a concise and clear definition of
- 45 EarthCube that embraces the innovation aspects of the program as well as the
- 46 concrete objective of creating usable infrastructure.”
- 47 ○ Section 2.3 Recommendation: “If ‘System of Systems’ represents the guiding
- 48 paradigm for realization of the kind of data-enable science advanced by
- 49 EarthCube, then the phrase must be defined in a way that lends itself to an
- 50 implementation strategy.” Also Section 5 Next Steps: “Write down the guiding
- 51 principles for what is clearly meant by the system of systems and what standards
- 52 it would need to address so that the community expectations can be channeled.”
- 53 ○ Section 3.1 Recommendation 1: “Roadmap documents should be... an
- 54 ‘implementation plan’ ...[that] should include specific prioritized milestones, and
- 55 clearly defined metrics against which program progress is to be measured.”
- 56 ○ Recommendation 2: “Short-term explicitly defined solutions are needed to avoid
- 57 volunteer fatigue and external criticism.”
- 58 ○ Section 4.1 Finding: There should be encouragement for research in the area of
- 59 data science, rather than just focusing on data curation.”

60 EarthCube Funded Projects

- 61 ● All [EarthCube Funded Projects](#)
- 62 ● [EarthCube Project Workspaces](#)
 - 63 ○ *(see architecture section below for Conceptual Designs)*
 - 64 ○ [EarthCube Building Blocks](#)
 - 65 ■ CINERGI [Inventory Portal](#), [EC page](#)
 - 66 ■ GeoWS [EC page](#); [Web services summary](#)
 - 67 ■ BCube [EC page](#); [Discovery Broker description](#)
 - 68 ■ ECITE [EC page](#)
 - 69 ■ GeoLink [EC Page](#)
 - 70 ■ GeoDataSpace [EC page](#)
 - 71 ■ Digital Crust
 - 72 ○ [EarthCube Integrative Activities](#)
 - 73 ■ Advancing CF/netCDF [EC page](#)
 - 74 ■ Alliance Testbed [EC page](#)
 - 75 ■ X-DOMES [EC page](#)
 - 76 ○ [EarthCube Research Coordination Networks](#)
 - 77

78 EarthCube Architecture Development

- 79 ● TAC Architecture WG Final Reports includes:
 - 80 ○ EC Architecture Workshop, San Diego, June 2015 ([google folder](#)); [Summary](#)
 - 81 [Presentation](#); [Workshop Report](#)
 - 82 ○ [Roadmap](#)
 - 83 ○ [WG final report](#)
- 84 ● EC Architecture Workshop AHM 2014 ([google folder](#)) [Summary presentation](#)
- 85 ● EC SoS Process Evolution Oct 2015 ([pptx](#)) Presentation for LC
- 86 ● [EarthCube Conceptual Designs](#)

EarthCube Architecture Workshop 2016: Architecture References (June 16, 2016)

- 87 ○ [GEAR landing page](#); [GEAR Executive Summary](#)
- 88 ○ [Scalable Community- Driven Architecture \(SC-DA\) summary](#) and [draft report](#)
- 89 ○ Data-Oriented Human-Centric Enterprise Architecture [DaSHER summary](#) and
- 90 [wiki](#)

91 Other EC Technology and Architecture Committee (TAC) WG 92 reports

- 93 ● TAC Standards WG outputs
 - 94 ○ Standards Compilation Matrix ([googlesheet](#))
 - 95 ○ Report of the [Standards Working Group](#)
 - 96 ○ [Standards Workplan](#) (27-Apr-2016)
- 97 ● TAC Gap Analysis WG [draft final report \(googledoc\)](#)
 - 98 ○ Gap Analysis [files \(google folder\)](#)
- 99 ● TAC Use Cases WG [landing page and links](#)
- 100 ● TAC Testbed WG [landing page and links](#)
- 101

102 System of Systems References

- 103 ● US Dept of Defense [System of Systems Engineering Guide](#)
- 104 ● IEEE Society for Systems Engineering
- 105 ● Papers in Jamshidi, Mo, ed., 2009, System of Systems Engineering for the 21st Century:
106 John Wiley and Sons, especially chapters 1-4 ([Chapters 1-3 available online](#),
107 introduction, approaches to engineering and architecture).
- 108 ● Introduction to systems of systems (Jamshidi, 2008) ([SoS definitions on p.2](#))
- 109 ● William Crossley, [System of Systems: An Introduction of Purdue University Schools of](#)
110 [Engineering's Signature Area](#), (SoS definition on pg. 2). Academic view of research
111 topics from DOD/aerospace perspective.
- 112 ● US GEO, Common Framework for Earth Observation Data, March 2016 ([pdf](#))
- 113 ● GEO XII Summit, Data Management Principles Implementation Guidelines, Nov 2015
114 ([pdf](#))
- 115 ● Jay Pearlman, Evolution of GEOSS, April 2006 ([ppt](#)) adapted for EarthCube 2016 ([ppt](#))
- 116 ● RDA Brokering Business Models paper, Benedict et al, Dec 2015 ([docx](#), 34 pgs)
- 117 ● RDA Brokering Business Models presentation, Powers et al, AGU 2015 ([pptx](#))
- 118 ● Center for Open Science [Transparency and Openness Promotion \(TOP\) Guidelines](#)
- 119 ● Paolo Mazzetti, et al (2015), ENERGIC-OD Virtual Hubs: a brokered architecture for
120 facilitating Open Data sharing and use, eChallenges e-2015 Conference Proceedings,
121 ISBN 978-1-905824-53-3 ([IEEE download](#))([pdf in workshop library](#))
- 122 ● Stefano Nativi, et al (2013), Earth Science Infrastructures Interoperability: The Brokering
123 Approach, IEEE Journal of Selected Topics in Applied Earth Observations and Remote
124 Sensing, vol 6:3, June 2013. ([pdf](#))
- 125 ● Ilya Zaslavsky, et al (2000), XML-based Spatial Data Mediation Infrastructure for Global
126 Interoperability, 4th Global Data Infrastructure Conference, Cape Town, South Africa.
127 ([pdf](#))
- 128

129 [Mapping the EarthCube Landscape](#)

130 An inventory of organizations external, but very relevant, to the NSF EarthCube
131 initiative.

132
133

134 Exemplar systems

- 135 • [ESGF](#) Earth System Grid Federation
- 136 • [NASA DAACs](#)
- 137 • NOAA - [NCEI](#); [Data Stewardship Maturity Matrix \(DSMM\)](#)
- 138 • USGS - [CIDA](#) / [NWIS](#) (historical interest-- [NWIS conceptual design](#) from 1987)
- 139 • CUAHSI - [Presentation from 2007](#)
- 140 • Datanet Federation Consortium ([DFC](#)), RENCi
- 141 • [XSEDE](#)
- 142 • [CyVerse](#)
- 143 • [NCI Australia](#)
- 144 • [IEDA](#)
- 145 • [GeoPrisms](#)
- 146 • [DataONE](#)
- 147 • [UNOLS](#)
- 148 • [GEOSS](#) - [GeoPortal](#) - [GEO DAB Portal](#) - [GEO DAB API](#)
- 149 • [ORNL Mercury](#)
- 150 • [NCSA Brown Dog](#)
- 151 • [Agave Platform](#)
- 152 • [A collection of NASA EOSDIS Architecture design/documentation \(dropbox folder\)](#)
- 153 • [DMPTool.org](#) - website of templates for most national agencies' Data Mgmt Plan
154 requirements
155

156 Enterprise Architecture References

- 157 • [FEA CRM 2007](#)

158

159 Metamodel References

- 160 • *Metamodel vs. Reference Model* discussion (re: metamodel reference in Final Report,
161 [Milestone 2 text](#)): is this a metamodel or a reference model? Answer is 'metamodel'.
162 **Argument1:** (for Reference Model) per Wikipedia,
163 • A [Reference Model](#) in systems, enterprise, and software engineering is an
164 abstract framework or domain-specific ontology consisting of an interlinked set of
165 clearly defined concepts produced by an expert or body of experts in order to
166 encourage clear communication.
167 • [Metamodel](#) or surrogate model is a model of a model, and metamodeling is the
168 process of generating such metamodels. Metamodeling or meta-modeling is the
169 analysis, construction and development of the frames, rules, constraints, models
170 and theories applicable and useful for modeling a predefined class of problems.

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171 **Argument2:** (for Metamodel) Fair enough - I offer more context.

- 172
- 173 • The [IDEF1X](#) explains it better and puts the metamodel link you note about into context.
 - 174 • Also I'd offer this is a [better wiki page for metadata modeling](#).
 - 175 • Finally, a non-wiki example of doing [LDM \(logical data modeling\) for metadata in a tool](#).

176 All that given, I didn't want to prescribe IDEF1x, but instead logical data model
177 which allows the designer to choose the LDM notation level.

178 **Argument1:** metadata modeling <> metamodeling; the IBM link is a metamodel (the
179 model elements represent things in a model, not in a model instance); is a model of an
180 "Rational System Architect encyclopedia"; instances of this encyclopedia would
181 represent an actual data model for a domain. Not clear how metadata modeling as
182 defined by the web page is different from a metamodel. What that page presents is
183 essentially a metamodel for UML.

184 **Argument2:** Agreed - Definitely not defending wikipedias pages :) . The links provided
185 explains it well. Also, I just put in the workshop library references directory [US Dept of](#)
186 [Interior Architecture metamodel work](#) - high-level intro and the master LDM view (have
187 several other views as well).

188 **Resolved:** it's a metamodel not a reference model. Interesting discussion highlighting
189 once again the challenges of cross domain (EA and data modeling in this case)
190 communication.

191 **Further clarification**, entered as footnote in final report, p.19:

- 192
- 193 • A metamodel is the schema for the metadata that will be stored in the resource
194 registry. Working in terms of the metamodel reduces the maintenance for
195 database applications. This positions the registry to be implemented either as a
196 RDBMS Catalog or a Metadata Repository. The latter would allow for flexible,
197 agile changes to the metamodel without having to re-write the database
198 structure. This can be explored more in the solution architecture.

199

200 Software Sustainability References

- 201
- 202 • UK Software Sustainability Institute: <http://www.software.ac.uk/>
 - 203 • Workshop series on software software for science:
204 <http://wssspe.researchcomputing.org.uk/>
 - 205 • [JOURNAL SPECIAL ISSUE](#)