Toward NASA Best Practices for ISO 19115

Benjamin White[1], Ted Habermann[2], Evelyn Nakamura[3], John Farley[3], Andrew Mitchell[4]

[1]OmniSystems, [2]HDF Group, [3]Raytheon Intelligence & Information Systems, [4]NASA

Abstract

NASA is rapidly evolving a series of best practices for ISO 19115. It is anticipated that these practices will allow stakeholders to more adequately describe, archive and catalog assets. They will also enable more efficient discovery, distribution, exploitation and interoperation of data.

NASA Best Practices for ISO

The NASA best practices for ISO 19115 incorporates a series of recommendations and requirements related to ISO 19115:2003 and ISO 19115-2. It also utilizes other forward-looking elements such as ISO 19115-1, lineage and has room for stakeholder outreach and feedback.

Additional Attributes

Additional attributes are often used by metadata authors to further describe the data represented. For example, ECHO uses additional attributes to document processing steps. However, with ISO, many additional attributes can be successfully mapped to standard ISO elements (Fig.1).

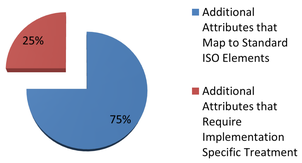

Figure 1: Up to 75% of additional attributes and 81% of their content can be mapped to standard ISO 19115.

Additional Attribute Type	Appropriate ISO Class
platformCharacteristic	MI_Platform (with extensions)
instrumentCharacteristic	MI_Instrument (with extensions)
sensorCharacteristic	MI_Sensor (new class)
algorithmParameter	LE_Processing (with extensions)
additionalAttribute	MD_SampleDimension (ISO 19115-1)
qualityInformation	DQ_QualityMeasure (ISO 19157)

Table 1: Additional Attribute Types and Appropriate ISO Classes.

The 25% of attributes that do not map directly to ISO can usually be accounted for through a series of rule-based categorical mappings e.g. attributes that are in the "quality" category are mapped to qualityinformation, or as depicted in Table 1.

Data Quality

The ISO data quality components povide a means for the standardized comparison of observations and for determination of suitability for inclusion in the long-term record. The NASA best Practices for ISO 19115 data quality expands upon:

- components and practices for data quality reporting;
- specific means of codifying data quality measures;
- processes in data quality evaluation and reporting;
- guidance on reporting on data performance relative to user requirements

	NASA ISO 19115	GCMD .DIF	ECHO	FGDC CSDGM
Customizable Measures	●		○	○
Reusable Measures	●		●	○
User Input to Usability	●			
Usage Limitations	●	●		●
Additional Attributes	●		●	○
Detailed Quality Measure Descr.	●			○

Figure 2: Comparison of NASA Implementation of ISO, GCMD .DIF, ECHO and CSDGM support for quality documentaiton.

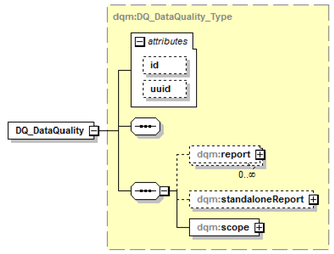

Figure 3: Major components of DQ_DataQuality. Note: In ISO 19115, lineage is a component of quality.

Lineage

The lineage portion of the NASA implementation of ISO 19115 details the history of the data product creation. The extended lineage components accomodate the challenges posed by the heterogeneity of NASA data products.

	NASA ISO 19115	GCMD .DIF	ECHO	FGDC CSDGM
Dedicated Lineage Package	●	○	○	●
• Process Step Lineage	●			●
• Additional Attributes	●	○	●	○
Source	●	●	○	●
• Source Input Uncertainty	●			
• Supports Multiple Sources	●	○	○	
• Supports Multiple Types of Sources	●	○		●

Figure 4: Comparison of NASA Implementation of ISO, GCMD .DIF, ECHO and CSDGM support for lineage documentaiton.

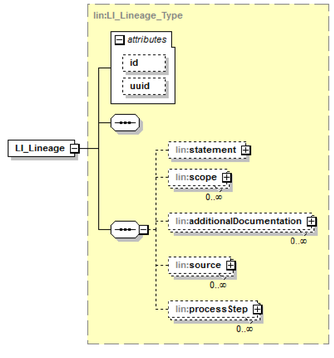

Figure 5: Major components of LI_Lineage.

Keywords

The NASA implementation of ISO can accomodate multiple keyword types and sources e.g. GCMD keywords, AGU topics, CF names.

	NASA ISO 19115	GCMD .DIF	ECHO	FGDC CSDGM
Thesauri	●			
• Multiple Sources	●			●
• GCMD Keywords	●	●	●	●
• Keyword Source Citation and URI	●	○		
Support for All Types of Keywords	●			
• Spatiotemporal Keywords	●	●	●	●
• Discipline, Theme, Stratum Keywords	●	●	●	
Ontology Connections	●			

Figure 6: Comparison of NASA implementation of ISO, GCMD, ECHO and FGDC support for keywords.

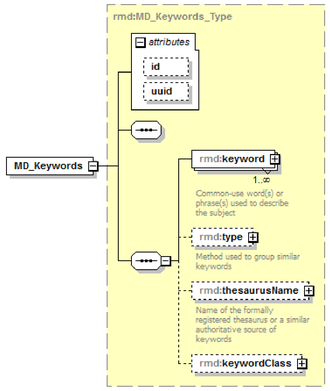

Figure 7: The major components of MD_Keyword. Note: Multiple thesauri, sources, classes, types are supported.

Conclusion

Data quality, lineage, keywords and the treatment of additional attributes are all key components of the NASA best practices for ISO 19115. However, the best practices are more than this, they address the full implementation lifecycle and pertain to both future and legacy data systems. Utilizing the best practices will bring value added to data sets and will help ensure their uniformity and integration into the long term record.

The NASA best practices for ISO 19115 are currently in draft and under review. The full version is due out Q1 2014.

Contact

Your perspective and knowledge is vital to the success of the best practices effort. Feel free to direct comments and inquiries to: Benjamin.White-NR@raytheon.com.

Responsible NASA official: Andrew E. Mitchell.