Standards and Best Practices – Two NASA Examples

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Abstract

Formal international standards as well as promotion of community or recommended practices have their place in ensuring "FAIRness" of data. Data management in NASA's Earth Observation System Data and Information System (EOSDIS) has benefited from both of these avenues to a significant extent. The purpose of this paper is to present one example of each of these, which promote (re)usability. The first is an ISO standard for specifying preservation content from Earth observation missions. The work on this started in 2011, informally within the Earth Science Information Partners (ESIP) in the US, while the European Space Agency (ESA) was leading an effort on Long-Term Data Preservation (LTDP). Resulting from the ESIP discussions was NASA's Preservation Content Specification, which was applied in 2012 as a requirement for NASA's new missions. ESA's Preserved Data Set Content (PDSC) document was codified into a document adopted by the Committee on Earth Observation Satellites (CEOS). It was recognized that it would be useful to combine PCS and PDSC into an ISO standard to ensure consistency in data preservation on a broader international scale. This standard, numbered ISO 19165-2 has been under development since mid-2017. The second is an example of developing recommendations for "best practices" within more limited (still fairly broad) communities. A Data Product Developers' Guide (DPDG) is currently being developed by one of NASA's Earth Science Data System Working Groups (ESDSWGs). It is for use by developers of products to be derived from Earth observation data to improve product (re)usability. One of the challenges in developing the guide is the fact that there are already many applicable standards and guides. The relevant information needs to be selected and expressed in a succinct manner, with appropriate pointers to references. The DPDG aims to compile the most applicable parts of earlier guides into a single document outlining the typical development process for Earth Science data products. Standards and best practices formally endorsed by the Earth Science Data and Information System (ESDIS) Standards Office (ESO), outputs from ESDSWGs (e.g., Dataset Interoperability Working Group, and Data Quality Working Group), and recommendations from Distributed Active Archive Centers and data producers are emphasized.

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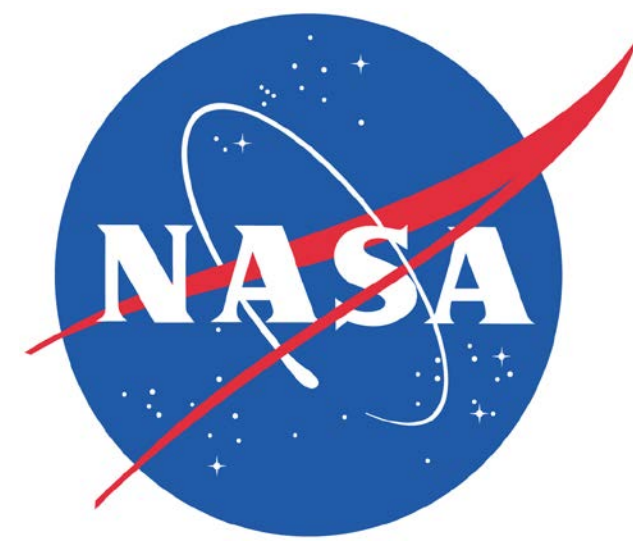
Community Process
- Less formal than "de jure" standards process
- Narrower community affected
- Faster review and adoption
- May involve adoption/adaptation of existing standards or development of recommended practices
- May lead to de jure standards

Earth Science Data System Working Groups
- Are formed, renewed, and retired on an annual cycle.
- Provide expert advice: Recommendations to ESDIS Project for decision making and prioritization.
- Address challenges, issues, and opportunities in response to ESDS Program priorities and community-identified needs.
- Develop guidelines and best practices for practical implementation of standards and technologies, enhancing data interoperability, and improving software development and software architecture practices.

Data Product Developer's Guide WG

Mission Statement
- Help Data Product developers make data more usable for End Users

Approach
- Develop overall format / template / outline
- Develop draft document
- Have document reviewed by DPDG WG and selected (small number of) others
- Revise document
- Submit to ESDIS Standards Office (ESO)
- Edit document in response to ESO review comments
- Publish and publicize

Stakeholders
- Data Producers
- DAACs
- Data Service Developers
- Tool Developers
- END USERS!!!

Outcomes, Deliverables, Milestones
Data Product Development Guide for Data Producers

Intended Audience
- People involved in producing standard Earth observation data products for NASA:
  - algorithm developers
  - science processing software developers
  - staff at the Distributed Active Archive Centers (DAACs)
  - data tool developers
- But, primary *beneficiaries* of data product development are the end users.
- We make recommendations that serve end users, though they may occasionally levy extra (but manageable) effort on data producers or DAACs.
- Producers of other Earth observation data products may find these guidelines useful as well.

ESDIS = Earth Science Data and Information System; ESDS = Earth Science Data Systems

Formal International Process
- "De jure" standards process
- Slow development
- Adoption not guaranteed
- Greater interoperability if widely adopted
- May need adaptation to circumstances applicable to narrower groups (e.g., by defining profiles)

International Standards Organization (ISO) - Standard Development Steps
- ❖ 00 – Preliminary
- ❖ 10 – Proposal – Approval through international balloting; Project Team members (experts from participating member countries) named to form Project Team (PT)
- ❖ 20 – Preparatory – New project is registered with Technical Committee (TC 211)
- ❖ 30 – Committee - CD registered; ballot initiated and closed; comments handled; CD approved for registration as Draft International Standard (DIS)
- ❖ 40 – Enquiry - DIS registered; ballot initiated and closed; comments handled; DIS approved for registration as Final Draft International Standard (FDIS)
- ❖ 50 – Approval – FDIS registered for formal approval; ballot initiated and closed; FDIS approved for publication
- ❖ 60 – Publication – International standard published

Example: ISO 19165-2 Geographic information -- Preservation of digital data and metadata -- Part 2: Content specifications for Earth observation data and derived digital products
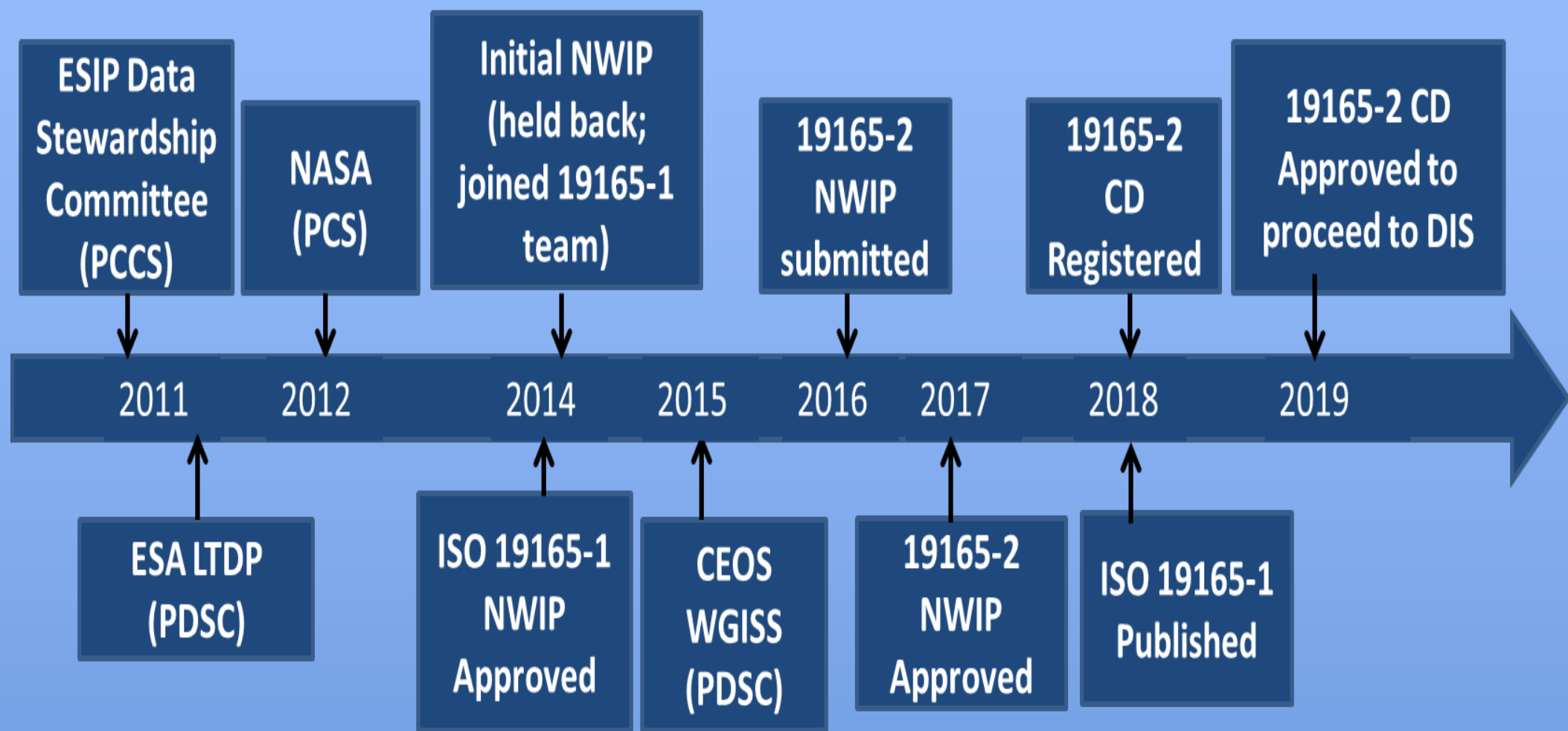
Abbr.	Meaning	Abbr.	Meaning
CD	Committee Draft	NASA	National Aeronautics and Space Administration
CEOS	Committee on Earth Observation Satellites	NWIP	New Work Item Proposal
DIS	Draft International Standard	PCCS	Provenance and Context Content Specification
ESA	European Space Agency	PCS	Preservation Content Specification
ESIP	Earth Science Information Partners	PDSC	Preserved Data Set Content
LTDP	Long-Term Data Preservation Program	WGISS	Working Group on Information Systems and Services

Earth Science Data and Information System (ESDIS) Standards Office (ESO) Process
(see IN21D-0875 for more details)

- Proposer(s)
  - Identifies a currently used standard, convention, or common practice that could be of benefit to NASA's ESDS
  - Submits documentation (Request for Comment – RFC) to ESO
- ESO
  - Performs initial screening through 3-4 member Technical Working Group
  - Identifies potential reviewers for broader review
  - Conducts community review of RFC
  - Coordinates with proposer(s) to disposition community comments
  - Publishes approved RFC at https://earthdata.nasa.gov/standards

ESO Standards in Action

Earth Observing System Data and Information System (EOSDIS)