

Proposal for Project to Develop A New Standard

IT/02-0656

1. Source of the Proposed Project

1.1 Title: **Geographic Information Framework Data Content Standards**

1.2 Date Submitted: **July 3,2002**

1.3 Proposer(s): **Federal Geographic Data Committee (FGDC)**

2. Process Description for the Proposed Project

2.1 Project Type: **D**

2.2 Type of Document: **Standard**

2.3 Definitions of Concepts and Special Terms:

Universe of Discourse: view of the real or hypothetical world that includes everything of interest

Conceptual model: model that defines the concepts of a universe of discourse

Conceptual schema: formal description of a conceptual model

Application schema: conceptual schema for data required by one or more applications (See ISO 19109)

Feature: abstraction of real world phenomena

National Spatial Data Infrastructure (NSDI) Framework data themes –seven themes of geographic data identified through various surveys as being required by a majority of users for various applications. The themes are described below:

1. **Cadastral:**

Cadastral data describe the geographic extent of past, current, and future right, title, and interest in real property, and the framework to support the description of that geographic extent. The geographic extent includes survey and description frameworks such as the Public Land Survey System, as well as parcel-by-parcel surveys and descriptions.

Cadastral (Offshore):

Offshore Cadastre is the land management system used on the Outer Continental Shelf. It extends from the baseline to the extent of United States jurisdiction. Existing coverage is currently limited to the conterminous United States and portions of Alaska. Maximum extent of United States jurisdiction is not yet mathematically calculated.

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2. **Digital Ortho Imagery:**

This dataset contains georeferenced images of the Earth's surface, collected by a sensor in which image object displacement has been removed for sensor distortions and orientation, and terrain relief. For very large surface areas, an Earth curvature correction may be applied. Digital orthoimages encode the optical electromagnetic spectrum as discrete values modeled in an array of georeferenced pixels. Digital orthoimages have the geometric characteristics of a map, and image qualities of a photograph.

3. **Elevation Bathymetric:**

The bathymetric data for Inland and Intercoastal waterways is highly accurate bathymetric sounding information collected to ensure that Federal navigation channels are maintained to their authorized depths. Bathymetric survey activities support the Nation's critical nautical charting program. This data is also used to create Electronic Navigational Charts. The bathymetric sounding data supports the elevation layer of the geospatial data framework.

Elevation Terrestrial: DOI, USGS

This data contains georeferenced digital representations of terrestrial surfaces, natural or manmade, which describe vertical position above or below a datum surface. Data may be encapsulated in an evenly spaced grid (raster form) or randomly spaced (triangular irregular network, hypsography, single points). The elevation points can have varying horizontal and vertical resolution and accuracy.

4. **Geodetic Control:** DOC, NOAA

Geodetic control provides a common reference system for establishing coordinates for all geographic data. All NSDI framework data and users' applications data require geodetic control to accurately register spatial data. The National Spatial Reference System is the fundamental geodetic control for the United States.

5. **Governmental Units:**

These data describe, by a consistent set of rules and semantic definitions, the official boundary of Federal, State, local, and Tribal governments.

6. **Hydrography:**

This data theme includes surface water features such as lakes, ponds, streams and rivers, canals, oceans, and coastlines. Each hydrography feature is assigned a permanent feature identification code (Environmental Protection Agency Reach Code) and may also be identified by a feature name. Spatial positions of features are encoded as centerlines and polygons. Also encoded is network connectivity and direction of flow.

7. **Transportation**

Transportation data are used to model the geographic locations, interconnectedness, and characteristics of the transportation system within the United States. The transportation system includes both physical and non-physical components representing all modes of travel that allow the movement of goods and people between locations.

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Data Content Standard: A standard that specifies what information is contained within a geospatial data set and provides a conceptual model and a conceptual schema to support a given domain, theme, or operation/application.

Framework Data Content Standard [hereafter referred to as Framework Standards] – a data content standard containing a core level of information content and service adequate to serve data exchange for Framework data themes. These are application schemas for the NSDI Framework themes.

2.4 Expected Relationship with Approved Reference Models, Frameworks, Architectures, etc.:

Framework standards will comply with the ISO Geographic information series of standards being developed through ISO Technical Committee 211, Geographic Information/Geomatics, and ANSI standards, wherever applicable.

Additionally, other standardization activities have yielded feature catalogs, conceptual data models, and data content standards for Framework data themes. These activities include the Federal Geographic Data committee (FGDC), NATO's Digital Geographic Information Working Group (DGIWG), the International Hydrographic Organization (IHO), and U.S. Federal, State, local agencies, and other private and public sector organizations. These standards and data models will be considered as input into this project. Refer to [Annex A](#) for relevant ISO, ANSI, and FGDC standards.

Framework Theme subject matter experts will be responsible for developing models for each theme. Standards development teams will include subject matter experts and will develop or adopt a framework data content standard based on previous work.

2.5 Recommended INCITS Development Technical Committee (Existing or New): [INCITS L1, Geographic Information Systems](#)

2.6 Anticipated Frequency and Duration of Meetings: [See attached Annex B, "Overview of the Standards Development Process for Geographic Information Framework Data Content Standards"](#)

2.7 Target Date of Initial Public Review: [January 2003](#)

2.8 Estimated Useful Life of Standard or Technical Report: [10 years or more](#)

3. Business Case for Developing the Proposed Standard or Technical Report

3.1 Description:

Development of Framework standards will be based on the ISO Geographic information series of standards, ANSI standards, FGDC standards, and other standards, as identified in [Annex A](#). Framework standards will initially address the seven themes identified as needed by a wide variety of applications for the

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NSDI. The Framework standards identified through this project will enable the creation of data sets that will allow users to more easily integrate data for a variety of applications.

A Framework data content standard shall include a conceptual schema expressed in UML. For a NSDI theme, the conceptual schema will specify, as appropriate, the feature types, attribute types, attribute domain, feature relationships, spatial representation, data organization, and metadata that define the information content of a data set. A Framework data content standard includes a format-independent specification of a conceptual model that can be implemented with one or more logical and physical models. The standards will include implementation profiles derived from the conceptual schema as annexes.

3.2. Existing Practice and the Need for a Standard:

A limited number of national and international data content standards support exchange of NSDI Framework digital geographic information. As a result, there is redundant collection and limited dissemination of geographic data within both the public and private sectors. Establishment of Framework standards will facilitate essential government services among 87,000 government entities in the United States and their private and academic partners.

Geospatial One-Stop is part of Office of Management and Budget's E-government initiative to accelerate federal government improvements in effectiveness, efficiency, and customer service. Geospatial One-Stop will provide a geographic component for e-government. An important aspect of Geospatial One-Stop is to develop data content standards for NSDI Framework data.

Development of the NSDI Framework has been hindered by the lack of data content standards for the seven NSDI Framework data themes. Many organizations need the same basic geographic data for their applications, but either collect that data individually (resulting in redundant and duplicative data collection) or do without the necessary data. A cooperative approach to producing and sharing datasets, collected according to common data content standards, will enable participants to save by sharing the costs of data production.

3.3. Implementation Impacts of the Proposed Standard

3.3.1 Development Costs:

The development cost for FGDC staff and lead organizations for each of the Framework standards is estimated to be \$3.875 million dollars in FY 2002 (ending 2002-09-30) and \$3.875 million dollars in FY 2003 (ending 2003-09-30). These costs will be borne by FGDC members and participating organizations. There should be no significant costs to INCITS associated with the development of these Standards.

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3.3.2 Impact on Existing or Potential Markets:

This standard will have a positive impact on the overall GIS community by promoting smoother data exchange among Federal, State, local, and tribal entities, as well as the private sector and academic community. The private sector (software developers and vendors) will benefit by developing tools that exploit data based on these data content standards. Data producers and consumers will benefit from improved access to data through common data content standards.

3.3.3 Costs and Methods for Conformity Assessment:

The UML model within a Framework data content standard will be tested for conformance with the ISO Geographic information series of standards. Additionally, conformance guidance will be provided to evaluate whether implementations are in conformance with Framework data content standards and the implementation annexes.

3.3.4 Return on Investment (ROI):

No specific ROI can be calculated at this time. However, a significant ROI can be expected, given the anticipated reduction in redundant efforts to acquire, collection, generate, and manage geographic information made possible by the sharing of data across applications, organizations, and sectors.

3.4 Legal Considerations

3.4.1 Patent Assertions: **None**

3.4.2 Dissemination of the Standard or Technical Report:

As these Framework Standards will be developed using public funds, the FGDC shall be able to freely publish and distribute the contents of these Framework Standards, including the framework models to the public (as provided through the Freedom of Information Act -FOIA.)

Upon adoption of Framework standards as American National Standards, the Information Technology Industry Council will copyright the American National Standards version of these Framework Standards on behalf of INCITS. Upon copyrighting these Framework Standards, ITI will provide free of charge to the FGDC a non-exclusive license to these Framework Standards in a format acceptable to all Parties.

4. Related Standards Activities

4.1 Existing Standards - See [Annex A](#)

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4.2 Related Standards Activity

ISO TC 211, Geographic information
FGDC
DGIWG – NATO
IHO

4.3 Recommendations for Coordinating Liaison: none

4.4 Recommendations for Close Liaison: none

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Annex A: Standards and Standardization Activities
Relevant to Geospatial One Stop

Standards Supporting More than One Theme

ANSI Standards

[*Spatial Data Standard for Facilities, Infrastructure, and Environment*](#), INCITS 353:2001

Feature type, attribute type, domain, and feature relationship information, etc. shall be extracted from the Spatial Data Standard for Facilities, Infrastructure, and Environment (SDSFIE), where applicable, for incorporation into Framework standards. Framework standards teams shall coordinate with maintainers of the SDSFIE recommend changes for consideration in future versions/editions of the SDSFIE. The project lead for this Framework Standards project will coordinate with the project lead for the SDSFIE as well as members of both project teams will participate and coordinate in relevant Framework standards/SDSFIE activities.

[*Spatial Data Transfer Standard \(SDTS\)*](#), ANSI NCITS 320:1998)

ISO Standards (refer to ISO [Program of Work](#))

ISO 19107, Geographic information – Spatial Schema

ISO 19109, Geographic information – Rules for application schema

ISO 19110, Geographic Information- Feature cataloging methodology (applies to transportation, hydrography, government units, and cadastral information)

ISO 19111, Geographic information – Spatial referencing by coordinates

ISO 19115, Geographic information – Metadata

ISO 19123, Geographic information - Schema for coverage geometry and functions (applies to orthoimagery and elevation)

FGDC Standards

[*Content Standard for Digital Geospatial Metadata \(version 2.0\)*](#), FGDC-STD-001-1998

[*Spatial Data Transfer Standard \(SDTS\), Part 5: Raster Profile and Extensions*](#), FGDC-STD-002.5

[*Spatial Data Transfer Standard \(SDTS\), Part 6: Point Profile*](#), FGDC-STD-002.6

[*SDTS Part 7: Computer-Aided Design and Drafting \(CADD\) Profile*](#), FGDC-STD-002.7-2000 - extends Vector Profile for CADD elements

[*Geospatial Positioning Accuracy Standard, Part 1, Reporting Methodology*](#), FGDC-STD-007.1-1998

[*Geospatial Positioning Accuracy Standard, Part 3, National Standard for Spatial Data Accuracy*](#), FGDC-STD-007.3-1998

[*Encoding Standard for Geospatial Metadata*](#) (draft stage)

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Annex A: Standards and Standardization Activities
Relevant to Geospatial One Stop

[FGDC Profile\(s\) of ISO 19115, Geographic information - Metadata](#) - suspended. Work underway by INCITS L1 to develop a national metadata standard (proposal stage)

Geodetic Control

FGDC Standards

[Geospatial Positioning Accuracy Standard, Part 2, Geodetic Control Networks](#), FGDC-STD-007.2-1998

Orthoimagery

FGDC Standards

[Content Standard for Digital Orthoimagery](#), FGDC-STD-008-1999

Elevation

FGDC Standardization Activities

[Content Standard for Framework Land Elevation Data](#) (completed public review)

Transportation

FGDC Standards and Standardization Activities

[Address Content Standard](#) (completed public review)

[Geospatial Positioning Accuracy Standard, Part 4: Architecture, Engineering Construction and Facilities Management](#), FGDC-STD-007.4-2002

[NSDI Framework Transportation Identification Standard](#) (completed public review)

Hydrography

FGDC Standardization Activities

[National Hydrography Framework Geospatial Data Content Standard](#) (proposal stage)

[Federal Standards for Delineation of Hydrologic Unit Boundaries](#) (proposal stage)

ANSI Standards

X3.145-1986 (R1997), Identification of Hydrologic Units in the United States and the Caribbean Outlying Areas, Codes for,

Governmental Units

[Governmental Unit Boundary Data Content Standard](#) (draft stage)

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Annex A: Standards and Standardization Activities
Relevant to Geospatial One Stop

ANSI Standards

X3.31 Structure for the Identification of the Counties and County Equivalents of the U.S. and its Outlying and Associated Areas for Information Interchange

X3.47 Structure for the Identification of Named Populated Places, Primary County Divisions and other Entities of the U.S. and its Outlying

Cadastral Information

[Cadastral Data Content Standard](#), FGDC-STD-003

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Annex B: Overview of the Standards Development Process for Framework Standards

Framework Data Content Standards are standards containing a level of information content and service adequate to serve data exchange for Framework data themes. These standards will serve as a foundation for data definitions and services within the Geospatial One-Stop initiative and in the exchange of data for Framework themes in other environments within the NSDI. These standards do not replace existing standards, but serve to identify a subset of possible content of FGDC Framework data themes that data producers, consumers, and vendors can use for the interchange of that data.

Each Framework Data Content Standard will include a conceptual schema expressed in the Unified Modeling Language (UML) according to ISO 19109, Rules for application schema, and its normative references, and textual documentation of all features, attributes, and relationships and their definitions. This part of a Framework Data Content Standard is an application schema as defined by ISO 19109. Each Framework Data Content Standard's specification shall also include an implementation model, expressed as an eXtensible Markup Language (XML) Schema, in an informative annex. The XML Schema will be automatically generated from the conceptual UML model and provided to implementers to help validate their implementations of each category of Framework data.

Where there may be more than one logical "layer" or theme per category, priorities will need to be set to determine initial Framework content. One or more standards development teams may need to be formed per category, based on available interest, funding, and time.

The following is the proposed project plan for developing the Framework standards.

1. Milestone 1 Approval of the Project Proposal

The FGDC has submitted a proposal for approval by ANSI/INCITS L1.

2. Milestone 2 Notification to the Public - INCITS Responsibility

3. Milestone 3 Technical Development

ANSI/INCITS rules call upon the Technical Committee, in this case, INCITS L1, to develop a detailed work plan:

Issue a request for participation and requirements. As seven Standards are envisioned, each will need a targeted request for participation and requirements.

INCITS L1 will draft a letter to inform and engage the widest possible participation. The request letter should include a solicitation of data content required for the interchange of data for the Framework data category. The letter should also invite individuals to participate on behalf of their organizations.

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Each Framework theme has different levels of complexity, history, and requirements behind them. In most cases, key federal agencies or other organizations and subject matter experts already have one or more standards or reference documents that include data content or functional agreements on the exchange of data for a given category. These documents may be used as primary inputs into the design process, but a request for supporting standards and requirements should go to relevant communities to verify that these standards represent current best practices and user requirements.

Constitute a Modeling Advisory Team (MAT). By the close of the call for participation and requirements, membership and governance in the MAT should be established. The MAT is envisioned to have between 9 and 15 organizations, although membership will not be restricted. A facilitator, supported by FGDC base funding, will be available to each standards development team to help manage the MAT function.

Collate existing user requirements, standards, and practices. The MAT will prepare a consolidated draft document based on members' experience and knowledge of existing standards and reference documents, and the contributions received from the Request. A modeler, supported by FGDC funding, will be available to each standards development team to develop the UML model with expert input from the MAT and their constituents. The modeler and MAT members will define candidate content based on available and prioritized requirements, standards, and practices. Decisions to include or exclude candidate features, functions, attributes, and relationships will be documented and made publicly available for review. The draft standard shall be formatted according to *Style Manual for preparation of proposed American National Standards* or *Drafting and Presentation of International Standards, ISO/IEC Directives --Part3* (see INCITS/SD-2, Organization, Rules and Procedures of INCITS at <http://www.ncits.org/sd2rev7b.htm>) and additional rules agreed upon by INCITS L1.

Convene Data Content Standard design session. In the Washington DC area, at least one multi-day facilitated, face-to-face design session to refine the draft content model and documentation will be convened.

The FGDC-provided facilitator and recorder will assist in these consensus-building sessions. The outcome of this session will be a draft conceptual schema in UML, the documentation of all its parts, and documentation of the functional requirements and choices made in the format of a draft standard document.

Provide draft Standard to Reviewers, Contributors, and Subscribers for initial review. Once the MAT has come to consensus on the Standard draft, including textual documentation, the MAT will make the standard available to other stakeholders. An adequate review period should be provided for reviewers to complete their evaluation of the draft. This review would precede the broader ANSI public review, but should include most primary organizations by virtue of their registered participation.

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Annex B: Overview of the Standards Development Process for Framework Standards

The MAT will revise the draft Standard and track and log comments and resolutions to comments received from the initial review to prepare a second draft of the Standard.

4. Milestone 4 Initial Public Review

Submit draft Standard to ANSI INCITS L1. The first ANSI/INCITS vote will take place within the L1 subcommittee. This vote will be to approve forwarding the draft standard to INCITS for a formal public review. If not approved, L1 will recommend specific action that needs to be taken. If approved the document is forward for ANSI public review.

Resolution of ANSI/INCITS public review comments. Comments received during the ANSI public review will need to be processed and resolved for passage to the next voting level.

5. Milestone 5 Management Review - by INCITS

6. Milestone 6 INCITS Approval

7. Milestone 7 ANSI Approval

8. Milestone 8 Publication

From: Andersen, Norman C. - LMC
Sent: Wednesday, July 3, 2002 7:51 AM
To: Bennett, Barbara
Cc: Roswell, Charles; Andersen, Norman
Importance: High

Barb,

Attached please find the INCITS L1 Project Proposal for "Geographic Information Framework Data Content Standards". This project proposal will be developed with the colaberation of the Federal Geographic Data Committee (FGDC), and will consist of a base standard and seven (7) parts.

The Base standard will address the common information which will be used in the seven technically specific parts, it will address such items as; Metadata, UML, common definitions, etc. The seven parts are identified as:

1. Cadastral:
2. Digital Ortho Imagery:
3. Elevation Bathymetric:
4. Geodetic Control: DOC, NOAA
5. Governmental Units:

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- 6. Hydrography:
- 7. Transportation

INCITS L1 ballot: 13 ballots cast (all voting members = 13), all in favor of proceeding forward, Thusly a unanimous vote.

<<INCITS L1 Proposal 20020430.doc>>

Norman C. Andersen
Chair, INCITS L1

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