BIOGRAPHICAL INFORMATION

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Petroleum/Pipeline Industry Manager
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Specific Responsibilities

Joined ESRI in 2000, is responsible for industry marketing in the petroleum and pipeline industry verticals.

Past experience

1982-1986: Shell Canada and Geological Survey of Canada, exploration and field geologist
1986-1994: various, joint ventures and consulting, mapping and GIS in petroleum
1994-2000: Landmark Halliburton, support, training and project management in petroleum applications and GIS worldwide

Educational Information

1980: B.Sc., University of Calgary, Calgary, Canada
1982: M.Sc., Queen's University, Kingston, Canada
Various continuing education in computing, GIS and project management

Professional Memberships

AAPG (www.aapg.org), 1979 – present, petroleum geologist
APEGGA (www.apegga.org), 1984 - present, professional geologist

STANDARDS AND METADATA - PART IV

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The modeling process, standards in that context, and use of metadata in the enterprise were covered in three previous talks (GITA the last two years, and PPDM this spring). The next step for the APDM (ArcGIS Pipeline Data Model) is to add intelligence thru metadata and to identify best practices. PPDM Spatial (Public Petroleum Data Model, Spatial Project, both in the relational and object domains) also has a metadata module, which helps manage context in a spatial sense. Metadata is the keystone that bridges structured and unstructured data, and helps turn the enterprise data warehouse into a digital earth model. Existing commercial and public web services attest to the fact that metadata increase the use and confidence in information and analyses based upon them.

INTRODUCTION

Parts I - III

Geodatabase modeling and metadata were introduced in previous GITA Oil&Gas (2003 and 2004) and PPDM (2005) meetings (Figure 1, and Arctur and Zeiler, 2004).

Modeling Process

The process is iterative, and cycles thru:

- Real world (objects, relationships)
- Conceptual model (sketches, flow diagrams, etc.)
- Logical model (diagram in CASE tool, ArcCatalog tools)
- Physical model (database schema, business rules)

Standards in this context

Standards are content models that describe the shape of the metadata. They allow the description of digital assets with consistency, and with the use of common technology. They are readable by people and by machines both

Data Model to Metadata

First stabilize the data models thru the data modeling consortium's processes. Then establish links among among related data models – for example among PODS and APDM data models. It is useful to create XML extension and to publish these extensions, in order to implement metadata. This helps users work with templates and data models from other industries – for example land cadastre is and adjunct for pipelines or wells.

Metadata to Enterprise

Metadata fuels the catalog service: Search for example the Metadata Service using ArcCatalog (part of ESRI's ArcGIS software) or the Metadata Explorer (part of ESRI's free ArcExplorer browser). It is easy to add data thus discovered directly to a map.

EXAMPLE DATA MODEL

ArcGIS Pipeline Data Model

APDM is a template designed by Steering and Technical committees of users, vendors and ESRI.Version 3 is on http://www.apdm.net, and the model has matured. It needs, however, to incorporate sufficient intelligence to help implement it: that is where metadata become important. It helps ensure interoperability between vendor applications. It goes beyond the standard content, and includes descriptive information as well as spatial information (reference, extent, scale, etc.).

Metadata content

In order to determine the metadata content, APDM abstract class types must be defined (online point and polyline, offline point, polyline and polygon, and other root APDM objects). So do mode behavior (systematic reference mode, relationships among reference modes) and event behavior (overlap and gap rules topology, and behavior relative to the centerline).

Storage options

There are several storage options to manage the metadata. In increasing level of complexity, there are the geodatabase metadata (FGDC and variants, ISO and variants, etc.), additional APDM object classes and domains (PODS Feature_Table entity), APDM custom feature classes nad class extension, and topology feature classes.

Maintenance and exchange

The maintenance and exchange of metadata and schema also offer options. There are schema and metadata tools (UML CASE tools, XMI, XML Workspace Document, etc.), metadata tools (ArcCatalog XML, topology etc.), and other formats such as CASE Data Interchange Format (CDIF).

Best practices

Best practices must also be identified: Which tools to use for what? Have tool limitations and unmet needs been identified? These include reverse engineering (geodatabase → XML workspace document → XMI → UML CASE Tool), storing spatial reference and topology in the UML, and issues with topology rules (such as point overlap)
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EXAMPLE METADATA MODEL

PPDM Spatial 4

It is warehouse style data summary of for management decision support systems, or GIS browsing applications. A high level, rolled up version of PPDM 3.7, it is a light weight model released publicly as PPDM Lite 1.0. It may be thought of as a simple warehouse or data mart model, that be spatially enabled using a GIS system (Boorman, 2004).

Review

PPDM Spatial is the instantiation of the spatial components of the full PPDM. It stores the geometry with attributes in the database. This includes the spatial index and stored behavior, such as sub-types, domain control, reference tables and geometry rules. The Spatial Module has been augmented in PPDM Spatial 5 with a Metadata Module.

The role of metadata

- Link to other datasets
  - infrastructure, environment, etc.
- Manage context in spatial sense
  - correct Well ID by location AND by name
- Improve unstructured data access
  - traverse area not entire document base
- Benefit from other protocols
  - ISO, FGDC, POSC, PPDM etc.

LESSONS LEARNED

Metadata in the enterprise

To recap, metadata fuels the catalog service. It allows to search metadata services using the catalog and metadata explorer. It is also easy to add search results directly to a map. And Z39.50 connectors helps search metadata services as part of the data clearinghouse.

Metadata as keystone for a digital earth model

Metadata allow to document and link structured and unstructured data (Figure 2). These include, respectively, cultural, geology, environment, pipeline, transportation, projects, wells, seismic, lease, production etc., and well records, well tests, legal description, lease plats, alignment sheets, survey, seismic plots, production decline, reserves etc. Such comprehensive documentation is necessary for complete descriptions of data toward an digital earth model. Previously done in point-solution specialized earth science applications, these can now be incorporate in a enterprise data warehouse suites.

Web services model

A current application includes the web services model:

- vendor data fuel applications
- integrator applications serve portals
- user portals traverse the enterprise.

Examples include the following data portals, and oil majors started theirs internally:

- http://energy.cr.usgs.gov/oilgas/wep/index.htm
- http://energy.cr.usgs.gov/oilgas/noga/index.htm
- http://www.geodata.gov
- http://www.ihsenergy/enerdeq
- http://www.mapdex.org
- http://www.petroweb.com/datamovers.htm
- http://www.tobin.com/tvdi.asp

CONCLUSION

Got metadata?

- the increased availability of data reflects the importance of metadata standards and procedures
- quality metadata increase the confidence users have in the information and analyses they conduct
- metadata promote the re-use and the understanding of data over a longer period of time

References

Arctur, David and Michael Zeiler, 2004: *Designing Geodatabases – Case Studies in GIS Data Modeling*, ESRI Press, Redlands CA, 393 pp.

Boorman, Peter, 2004: *Incorporating PPDM Spatial into business processes*, Public Petroleum Data Model Fall Meeting, Calgary AB.

Figure 1: GIS design and process modeling

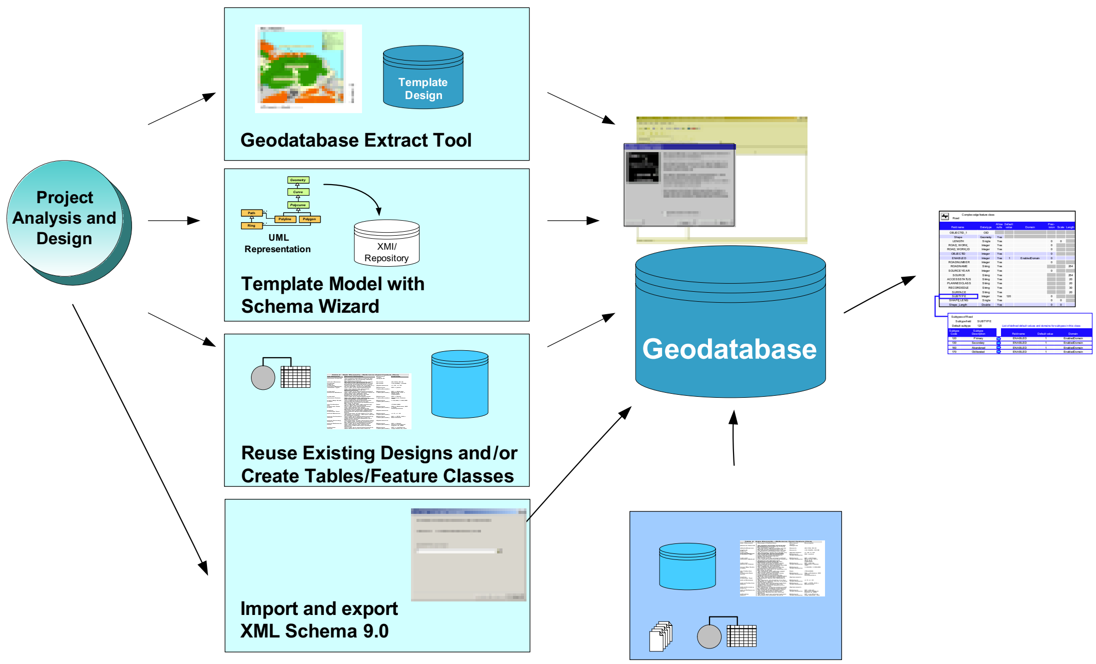

Figure 2: Metadata as keystone