UPDM
Utility & Pipeline Data Model

Esri Electric and GIS Conference
Update Technical Session
Wednesday, October 7, 2015
8:30 am – 9:15 am
About UPDM

Esri’s UPDM is a geodatabase data model template for operators of pipe networks in the gas and hazardous liquids industries. UPDM is a

- moderately normalized data model
- that explicitly represents each physical component of a pipe network from the wellhead to the customer meter, terminal or delivery point, in a single database table object.
Business Drivers for UPDM

- Enable vertically integrated gas companies that have distribution, transmission and gathering pipe networks to use one data model
  - The trend is to a smaller number of bigger gas companies
  - More gas companies will have integrated systems including a combination of distribution, transmission and gathering assets
  - How those high pressure distribution pipes are operated and how they are regulated will differ
- Enable location referencing and connectivity modeling to operate on the same geodatabase
Business Drivers for UPDM

- Simplify staff training
  - Single workflow for maintaining distribution, transmission and gathering asset data
- Better manage HP Distribution pipe (> 20% SMYS)
- Improve staff efficiency and productivity
UPDM evolution

- Traces its heritage to the first release of the Gas Data Model in 2001, being renamed now to reflect broadened scope
- Partners and customers always have played a role in the development of the Gas Data Model, and they are playing an active role in the evolution of UPDM
- The latest release of UPDM occurred July 1, 2015.
UPDM adoption

- As of September 30, 2015, UPDM has been downloaded by non-Esri employees 545 times since.

Heat map as of end of July 2015
UPDM adoption

- Early adopting customers of various types already are implementing UPDM:
  - Vertically integrated gas company
  - Hazardous liquids pipeline
  - Gas transmission pipeline
UPDM adoption

- Esri solutions are based on UPDM.
- ALRP is home-based on UPDM. An alternative data model is in development by the PODS Association,
- Partners are developing on UPDM.
  - DNV GL
  - Eagle Information Mapping
  - Geonamic Systems
  - New Century Software
  - Novara GeoSolutions
Peoples Natural Gas
Pittsburgh, PA

Gas System
- 700,000 Customers
- 15,000 Miles Distribution Pipe
- 153 Miles of Transmission Pipe

10 Desktop As-Built Editors
1300 Office Web Viewers
750 Mobile Users

UPDM Deployment
Went Live with UPDM, July 2015
Technical Drivers to Evolve UPDM

- Represent “Best practice” for managing data in a Geodatabase
- Align with ArcGIS Pro and advances being developed in the ArcGIS Pro environment
- Align with ArcGIS Location Referencing for Pipelines extension
- Improve scalability and performance for larger transmission pipe networks using fully normalized data models (Performance and scalability issues not currently existing in the gas distribution user community)
UPDM support

- Esri has actively maintained and enhanced the Gas Data Model through the years, and that will continue with UPDM.
Geodatabase Concepts & UPDM

- All events stored as features
- Connectivity model used to maintain physical assets
- Linear referencing model used to maintain transmission integrity data
- Metadata managed as part of feature (Editor Tracking & Archiving)
- Documents managed with Attachments
- Time Aware (be able to view system at different states in time)
Improving Performance thru Better Data Management
Transmission – Viewing Pipe Segments

Database Activity with Legacy Data Model
• 1 – Geodatabase
• 3 – Tables/Featureclasses queried

Database Activity with UPDM
• 1 Geodatabase
• 1 – Featureclass queried

66% Reduction in SQL queries in the database
Improving Performance thru Better Data Management
Transmission & Distribution – Viewing Pipe Segments

Database Activity with Legacy Data Model
• 2 – Geodatabases
• 4 – Tables/Featureclasses queried

Database Activity with UPDM
• 1 Geodatabase
• 1 – Featureclass queried

75% Reduction in SQL queries in the database
Improving Scalability thru Data Storage Efficiency

Transmission

Legacy Data Models

PipeSegment
PipeSegmentAudit
Valve
ValveAudit

UPDM

Pipes
Valves

50% Reduction in Records stored in the database
Improving Scalability thru Data Storage Efficiency
Transmission & Distribution

Legacy Data Models
- PipeSegment
- PipeSegmentAudit
- Mains

UPDM
- Pipes

33% Reduction in Records stored in the database
66% Reduction in tables stored in the database
Release Schedule for UPDM

July 1, 2015 release of UPDM supports ALRP requirements. Next release scheduled for Q4 2015.
## Release Sequence

<table>
<thead>
<tr>
<th></th>
<th>Configured for Geometric Network</th>
<th>Configured for Utility Network</th>
<th>ALRP Schema</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPDM (Oct 2014)</td>
<td>Yes</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>UPDM (July 2015)</td>
<td>Yes</td>
<td></td>
<td>Yes (alpha)</td>
</tr>
<tr>
<td>UPDM (Q4 2015)</td>
<td>Yes</td>
<td></td>
<td>Yes (final)</td>
</tr>
<tr>
<td>UPDM (Q3/Q4 2016)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
ALRP – ArcGIS Location Referencing for Pipelines

- Point Events (FC)
- Line Events (FC)
- Routes (table)
- Centerlines (FC)
- Pipes (FC)

Gathering | Transmission | Distribution

CS | TBS | HP MP/LP

RC
ALRP Schema in UPDM

- **P_Centerline** (Polyline FC)
  - CENTERLINEIDGUID
  - TODATE

- **P_Centerline_Sequence** (Table)
  - FROMDATE
  - TODATE
  - ROUTEID
  - CENTERLINEIDGUID
  - NETWORKID

- **P_CalibrationPoints** (FC)
  - MEASURE
  - FROMDATE
  - TODATE
  - ROUTEID
  - NETWORKID

- **P_Redline** (FC)
  - EFFECTIVEDATE
  - MEASURE
  - NETWORKID
  - ROUTEID
  - ROUTENAME
  - ACTIVITYTYPE

- **P_ContinuousNetwork** (FC)
  - ROUTEID
  - ROUTENAME
  - FROMDATE
  - TODATE

- **P_StationSeriesNetwork** (FC)
  - ROUTEID
  - ROUTENAME
  - LINEID
  - LINENAME
  - ORDERID
  - FROMDATE
  - TODATE

- **POINT EVENTS** (FC)
  - EVENTID
  - ROUTEID
  - FROMDATE
  - TODATE
  - MEASURE
  - LOCATIONERROR
  - REFMETHOD
  - REFLOCATION
  - REFOFFSET

- **LINE EVENTS** (FC)
  - EVENTID
  - ROUTEID
  - FROMDATE
  - TODATE
  - LOCATIONERROR
  - FROMMEASURE
  - FROMREFMETHOD
  - FROMREFLOCATION
  - FROMREFOFFSET
  - TOMEASURE
  - TOREFMETHOD
  - TOREFLOCATION
  - TOREFOFFSET
Utility Network