Implementing ArcGIS® Schematics for Utilities and Transportation

An ESRI® White Paper • May 2006

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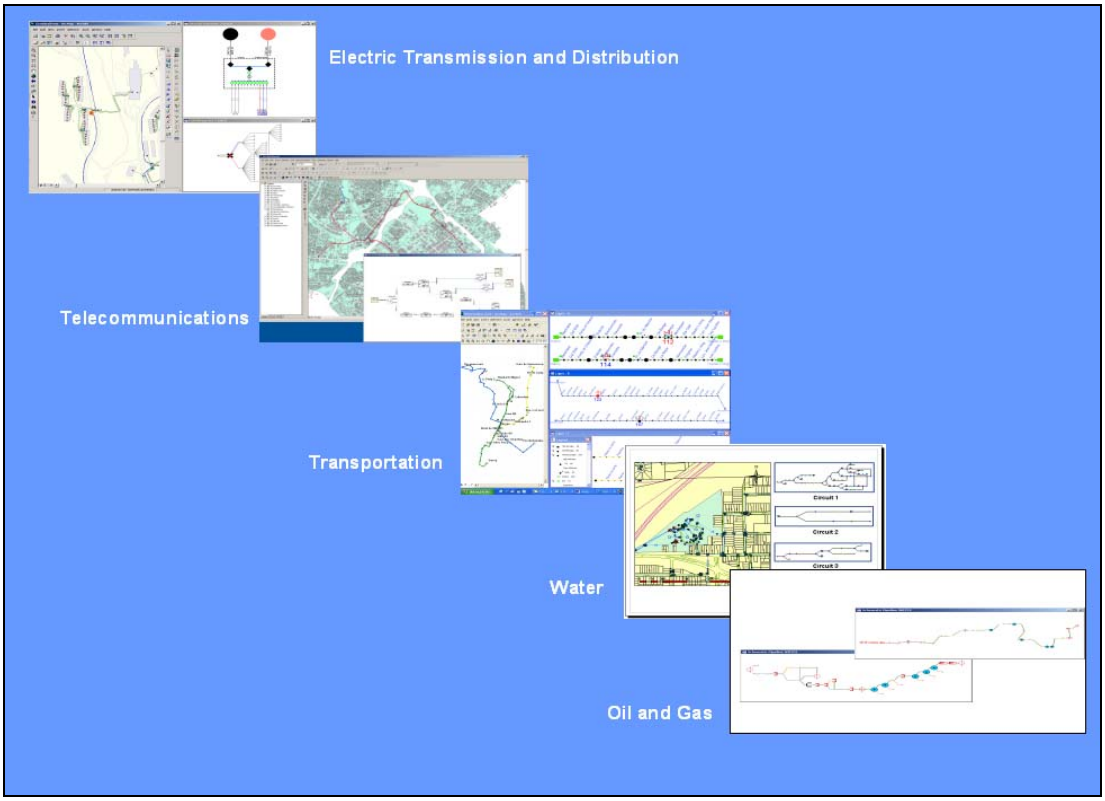

ArcGIS Schematics for Utilities and Transportation

Overview

The ArcGIS® Schematics extension to the ArcGIS Desktop product provides rich tools for the creation and manipulation of schematic views of geodatabase features. The ability to view logical network connectivity alongside the physical network in ArcMap™ offers end users powerful visualization and analysis capabilities.

Traditionally, one database or file workspace and application stores and maintains geographic information system (GIS) features, while a separate set of files and applications maintains the schematic representation of those same features. ArcGIS Schematics allows customers to break with tradition because it is a data driven solution: the extension references the same database in which the GIS features are stored, so edits made from the GIS application are automatically available as updates within the schematic network views. This means the maintenance overhead required in a traditional system is effectively cut in half for organizations with physical and logical representations of their geographic data. However, this benefit is not just limited to GIS feature schematics.

A single ArcGIS Schematics project can simultaneously connect to multiple data sources in addition to the geodatabase. Thus, schematics for non-GIS elements (e.g., inside plant connectivity) can also be viewed and analyzed in the context of GIS. The respective applications that handle aspatial elements best manage and edit them while users still benefit from automatic updates to their Schematics documents.

The ArcGIS Schematics extension consists of two packages.

- **ArcMap extension:** Provides Schematics tools and controls within the ArcMap application.
- **ArcGIS Schematics Designer:** Allows configuration of the Schematics session by an administrator.

All existing ArcGIS Desktop clients involved in any of the following domains (electric, oil and gas, water/wastewater, transportation, or telecommunications) should seriously consider investing in ArcGIS Schematics to realize the unique benefits that the extension offers.

Implementation

Post implementation, the Schematics end user interface provides a diverse tool set for quickly and efficiently organizing elements within the schematic views manually or with out-of-the-box or custom algorithms. However, to successfully deploy the functionality to the end user, Schematics' project parameters configuration is required to tailor the application to the client's environment and deliver functionality to the end user. In addition, requirements for specific business products or functionality sometimes necessitate development of custom behavior and positioning algorithms that can in turn be made available to the end user through the ArcGIS Schematics configuration.

Successful deployments of ArcGIS Schematics require a number of steps, and the magnitude and complexity can vary from client to client. The key implementation steps are as follows:

- Data modeling iterations or existing data model review.
- Build network connectivity.
- Configure the ArcGIS Schematics project parameters.
- Develop custom application behaviors and/or algorithms (optional).
- Deployment.

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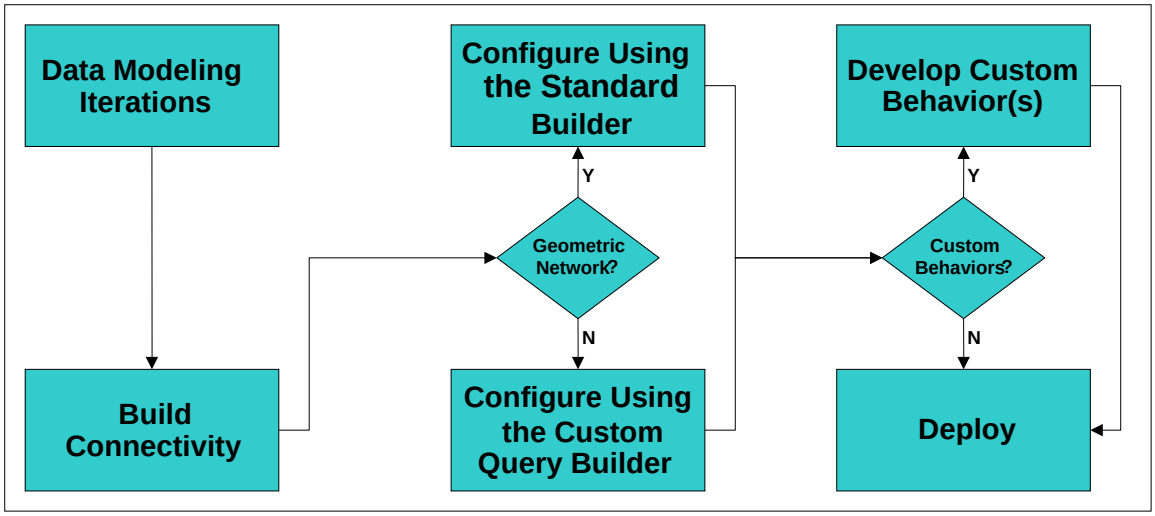

The ArcGIS Schematics Implementation Cycle

Clients considering an ArcGIS Schematics installation should give special consideration to their data model, most specifically the storage and maintenance of feature connectivity. Standard data modeling practices apply, but clients should answer a number of questions as part of their data modeling or model review activities. Among them are

- What elements do I want to include in schematic views?
- Do all these elements correspond to geographic features?
- Are some elements lower-level features that do not relate to geodatabase features?
- How do these elements relate to geodatabase features?
- Do all geographic features participate in a geometric network?
- How will I maintain connectivity information?
- Do I want to migrate data for low-level elements from other databases to the geodatabase, or will I connect directly to the other databases from Schematics?

For those clients dealing only with geographic features who are also participating in a geometric network, little or no extra work will likely be required to use their data with Schematics. Clients with both spatial and nonspatial elements participating in complex relationships could require substantial planning and modeling. In either instance, it is important to evaluate existing models or consider these details during creation of new data models.

Network connectivity generation follows creation or review of the data. This activity, although relatively straightforward, may require a significant level of effort. Connectivity may be built by generation of a geometric network in ArcCatalog™ for clients depicting only geographic features, while schematics containing aspatial features

require population and validation of explicit to/from connectivity or element relationships.

After addressing data considerations, the ArcGIS Schematics project is configured with ArcGIS Schematics Designer. This application is used to define the Schematics data source connections, diagram types, element types (nodes and links [junctions and edges]), symbology, queries, properties, and application behaviors. Users with geometric network connectivity may also make use of the "Standard Builder" diagram type builder that is delivered with the product to get up and running quickly, then optionally configure the diagram type(s) further with Designer.

At this point, the application may be deployed directly to end users. However, if custom behaviors or positioning algorithms are required, they must be developed prior to deployment. Users will leverage the objects available through the ArcObjects™ application programming interface to code the needed custom functionality. Configuration with ArcGIS Schematics Designer makes the functionality available within the end user application.

ESRI Professional Services

The ArcGIS Schematics Designer interface provides the tools to configure the ArcGIS Schematics project, and developers can use ArcObjects to extend the base application to meet specific requirements. Unfortunately, clients can face a significant learning curve in Schematics configuration and are often intimidated by the Designer application and ArcObjects. This learning curve can discourage clients from implementing ArcGIS Schematics and prevent them from realizing the significant productivity and analysis gains the extension provides.

This is regrettable, because clients faced with a growing backlog of outdated schematic drawings, which they simply did not have the time or resources to maintain, have found that a successful ArcGIS Schematics implementation allowed them to completely "leapfrog" the backlog by accessing their existing databases directly with ArcGIS Schematics. Most significant, implementing ArcGIS Schematics is less painful than facing the backlog, and the benefits realized far outweigh the one-time cost of implementation and are felt each time the database is edited.

ESRI Redlands Professional Services Division can help clients successfully implement ArcGIS Schematics at their site. The Professional Services Division has built a team of consulting, development, and project management staff who work closely with the ArcGIS Schematics development team. This group has helped clients face the Schematics learning curve, and their experience is growing with each new project.

Prior projects have shown clients are best served by pilot ArcGIS Schematics implementations that deliver consulting and training services while working directly with client data. Pilot projects have not only allowed client staff to get over the learning curve but also directly appreciate the Schematics work flow and realize the benefits with their own data. This allows them to decide whether to undertake full implementation themselves or contract for additional services.

The Professional Services Division offers clients undertaking ArcGIS Schematics implementations a broad range of services including

- Data modeling and data model reviews
- Analysis of existing schematic drawings
- Pilot projects
- Configuration
- Administrator and end user training
- Third party application and database integration
- Custom application behaviors and algorithms development

If you have utilities clients considering Schematics implementation needing ArcGIS Schematics consulting services, please contact Will Chesser with ESRI Redlands Professional Services Division at wchesser@esri.com or 909-793-2853, extension 2065.

For more than 35 years, ESRI has been helping people manage and analyze geographic information. ESRI offers a framework for implementing GIS technology in any organization with a seamless link from personal GIS on the desktop to enterprise-wide GIS client/server and data management systems. ESRI GIS solutions are flexible and can be customized to meet the needs of our users. ESRI is a full-service GIS company, ready to help you begin, grow, and build success with GIS.

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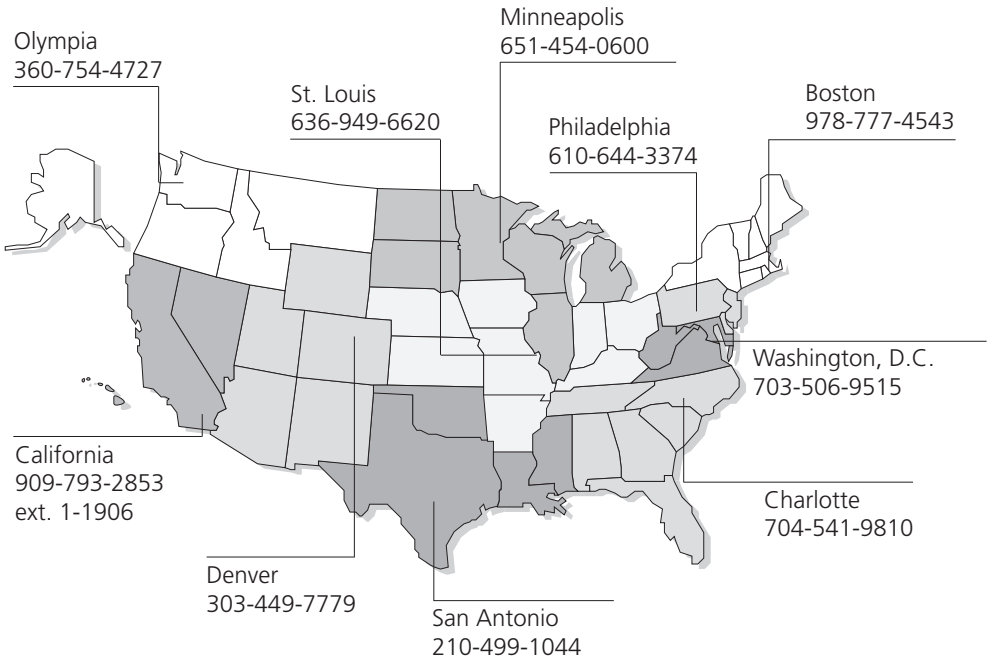

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