AN ESRI
WHITE PAPER

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The Road Ahead for Network Management

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The Road Ahead for Network Management

Executive Summary

For the last several years, Esri has been expanding the ArcGIS® platform. In fact, the single platform consists of three integrated concepts: system of record, system of engagement, and system of insight. The system of engagement, based on ArcGIS℠ Online and ArcGIS Enterprise, provides the infrastructure to communicate, share, and collaborate with a broad range of people, which makes it similar to the popular social platforms people use in their everyday lives. The system of insight goes one step further. It gives users the ability to better understand the relationships of people, assets, and data by using approaches such as spatial analysis and geoanalytics.

Utilities and telecom companies are rapidly adopting the system of engagement today. They are also beginning to leverage the system of insight.

For decades, these companies have been using geographic information system (GIS) technology primarily as their system of record.

Utilities and telecom companies have always needed to map their assets. Their devices, transformers, routers, pipes, valves, and wires were distributed throughout the companies' service areas. Early mapping systems were based simply on computer-aided design concepts. In the old days, the mapped records of company assets were called automated mapping/facilities management (AM/FM). Some people still call GIS an AM/FM system. The idea was to create printed maps faster and more easily. Over time, utilities began to see the value of information on a map. While GIS has served utilities well as a system of record, they are now seeking more. They need the system of record with its advanced modeling capabilities in order to handle the proliferation of sensors and be better able to manage smart grid, gas, water, and telecom networks.

Utilities and telecom companies are requiring higher performance, greater scalability, more sophisticated transaction mechanisms, and full cross-platform capability—so as to better leverage the systems of engagement and insight.

The current Esri technology-based geometric network and versioning-based solution were envisioned back in the 1998/1999 time frame as part of the initial ArcGIS Desktop project. This network and solution have served customers well for nearly two decades and will continue to do so for the next few years. However, the requirements and needs of utilities and telecom companies have changed, and they need a solution that better addresses not only current but also ever-growing needs: smart grid,

distributed generation, the Internet of Things (IOT), real-time data integration, and the merger of information technology (IT) and operational technology (OT) systems. These companies need a cross-platform solution to take them through the next two decades.

Esri is now completely revamping its system of record not only to provide new capabilities in that area, but also to continue to enhance the overall platform and improve capabilities with the system or engagement and the system of insight. The purpose of this white paper is to highlight the details of the new ArcGIS Utility Network Management extension to ArcGIS Enterprise, which is the delivery mechanism for the new capabilities. The new extension can be broken down many different ways, but for the sake of this white paper we will break it into two main parts:

- The new Esri utility network
- New core architectural features that will enhance network management and provide a better framework for users and partners to build their applications and solutions

The utility network is a key technology of the project. While the utility network is initially focused on electric, gas, and water networks, it applies equally to telecom networks and other network such as wastewater, stormwater, rail, etc.. The ArcGIS Utility Network Management extension focus is on the locational data infrastructure of these types of companies and all the workflows to keep the system of record current.

The ArcGIS Utility Network Management extension includes the following:

- The utility network – new network designed specifically to manage utility and telecom network data.
- Cross-platform support—Making the functionality of the utility network available on any device, anytime, anywhere
- Services-based architecture—All aspects of working with the network (view, query, editing, analysis, etc.) are done through services.

- The new Utility Network
  - Connectivity—Standard connectivity based on geographic coincidence (x, y, and z) plus the ability to establish connectivity between devices that are not spatially coincident
  - Containment—Allowing devices to be contained in other devices or objects (substations, switchgear, regulator stations, cabinets, etc.)
  - Structural attachments—Managing structures in the network that contain devices or have devices attached to them (devices on a pole)
  - Multiple terminals—Modeling multiple connection points for devices
  - Expanded tracing framework
  - Built-in support for network (schematic) diagrams
  - Expanded validation framework
    i. Network topology validation enforced through rule based engine
    ii. Business validation through user configured rules
  - Basic subnetwork management

- Export capabilities

- Other core improvements that work with the utility network and network management:
  - An updated transaction model to improve overall performance and reduce management overhead
  - Attribute rule framework—New and expanded ability to automate the setting of attribute values based on defined rules (for example, if the LifeCycle attribute on my pipe is set to "Abandoned", then set the Pressure attribute to "None")
  - New layer capabilities including display filters, visual variables, and subtype layers.
  - Enhanced editing experience (initially through ArcGIS Pro, but expanded to all clients in later releases)
    i. Expanded feature template model for adding devices in bulk
    ii. Snapping based on connectivity rules

This network management updates create an entirely new framework for the system of record. However, there is much that utility and telecom companies can already do with the ArcGIS platform, and Esri encourages users to take advantage of the many different features now available. Esri strongly recommends that organizations implement the system of engagement using ArcGIS Enterprise and/or ArcGIS Online to help bring GIS to the many other people who aren't currently using it.

For several years, Esri has been discussing the advantages of migrating to ArcGIS 10.2.1 Desktop, as it is the release specifically for utility and telecom company workflows. Esri continues to provide patches for this release (the seventh patch was made available in January 2017, targeting the data maintenance workflows around the geometric network, versioning, and replication).

What to Do Now

Figure 1 shows the recommended network management process utilities and telecom companies can follow now.

1. Set up ArcGIS Enterprise (which now includes Portal for ArcGIS). This gives users the ability to share their current network information throughout the organization as well as with those outside whom they select. This provides the framework for the system of engagement.
2. Upgrade to ArcGIS 10.2.1 Desktop and the latest releases of all other products (f you haven't already). Make sure to install the most recent patches. The latest release of other Esri products are compatible with ArcGIS 10.2.1 Desktop.
3. Stay current on platform improvements. There are new platform capabilities being released regularly.
4. Make use of ArcGIS for the electric, gas, water, and telecommunication capabilities available for download at http://solutions.arcgis.com/

5. Move to the new ArcGIS Utility Network Management extension when it is released. Esri will be releasing scripts to help in the migration process.

Users who have a considerable investment in custom applications can migrate them to ArcGIS Enterprise/ArcGIS Online now. In many cases, those custom applications will only require configuration of the platform. This will save considerable effort when it's time to move to the ArcGIS Utility Network Management extension.

The ArcGIS Solutions site http://solutions.arcgis.com/ offers many maps and apps for utility and telecom domains that organizations can take advantage of to jump-start their solutions, particularly in the web and mobile areas. One of the most popular downloads from the Solutions site is the Model Organization app, which provides users with a series of guidelines to follow when setting up an ArcGIS organization.

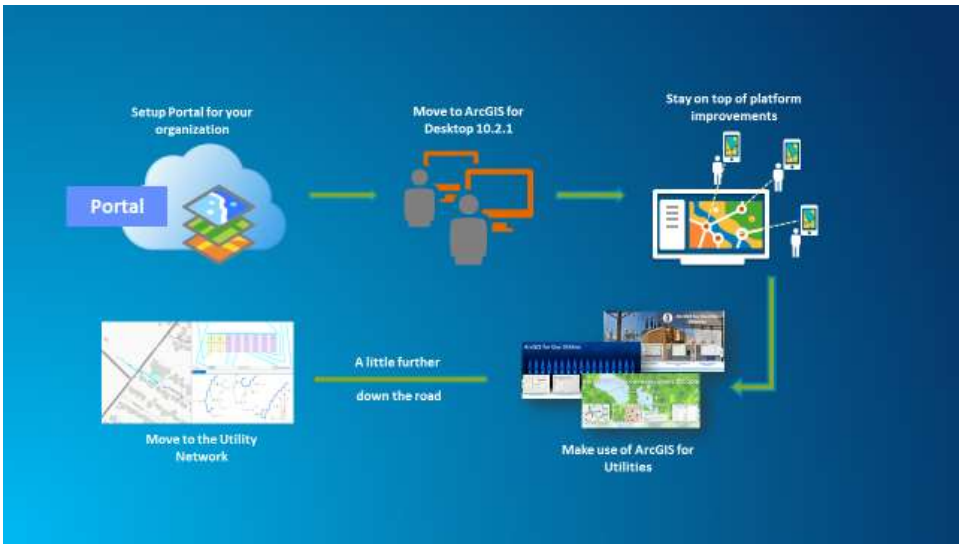

Figure 1: What Users Can Do Now

The Vision

Why is Esri updating the System of Record with the new extension? The goals for this project are as follows:

- Provide utility customers with the ability to model, edit, and analyze complex networks of facility infrastructure using all Esri platform clients
- Enable key modeling concepts to better support a true representation of what is on the ground, while fostering an easy exchange of network information with other mission-critical systems
- Support highly responsive editing and analysis capabilities

It is not sufficient to provide a high-end editing and analysis solution solely on the desktop, as utility and telecom personnel are working away from their desk more often, out in the field and at other locations. All the capabilities of the network must be available wherever people are working.

With smart grid and other requirements, it is increasingly important to model within the GIS what is actually on the ground. This drives the need to perform more and better analyses within the GIS as well as the need for making it easier to exchange data with the other mission-critical systems that utilities and telecom companies currently use.

Performance is important with any system. Esri is working to improve capabilities of the network and the asset management solution wherever users want to work.

Esri is significantly expanding network functionality. However, there are two fundamental capabilities that underpin the entire effort:

- Cross-platform support
- Services-based architecture

Esri has been building modern platform capabilities into ArcGIS for several years. With the current platform, network data can certainly be managed through ArcGIS. However, there are some limitations to using the network through all clients. The new Network Management project will deliver full network capabilities across the entire platform, providing true cross-platform support.

What will make this happen is the fact that all the transactions and functionalities associated with the new Utility Network will be implemented using services.

The Role of Partners

The current technology includes versioning, the geometric network, and replication. In many cases, partners have supplemented the solution to provide specific domain functionality and some extended core capabilities.

Going forward, some functionality that is currently handled by partner solutions will be moved into the core software. These aspects are generic in nature (that is, the capabilities are important not only to utilities and telecom companies but also to many other verticals that use ArcGIS software) and will be beneficial to all ArcGIS users.

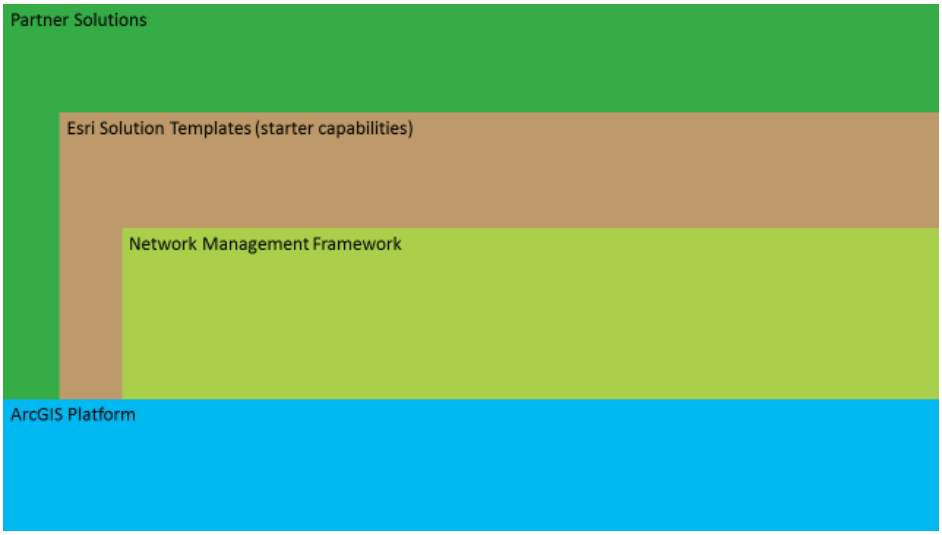

Figure 2: While Esri is expanding the core capability, partners will have a large role in extending the capabilities.

In addition, Esri sees part of the solution as being offered by the Esri Solution Division in the form of base data models and map configurations to supplement the base models. However, all of this does not mean that partner solutions will become less important or less needed. The updated platform and new capabilities of the Utility Network and other aspects of the project will provide increased potential for partners to grow the overall solution, providing additional value to the end user.

Partners will provide extended capabilities around design, analytics, integration, and productivity. They will do this through configurations to the out-of-the-box tools, custom tools, and custom applications.

Partners will also be expected to play a role in helping many users move to the Utility Network. Partners will provide extended data models and the modified scripts to help users move to those models.

Where Esri expects to see a substantial reduction in the solution stack is in the area of customization performed by the end user. The improvements in the core software and framework should make it possible for end users to do much more out of the box, through configuration, or through partner solutions, without in-house customization.

Figure 2 illustrates the role of partners in the new network environment. Note that as Esri's role has expanded, the opportunities for partners have increased as well. Partners will be able to focus on value-added capabilities, not on extending the core platform.

- Partners will continue to play a key role in completing solutions and assisting users in moving forward.
- Esri will provide base domain data models, which the partners will extend.
- Esri will provide sample tools and/or scripts to load data. Partners will extend and enhance these scripts for their particular solutions.
- Partners will continue to extend and complete the solutions by
    - Delivering design, analytics, integration, and productivity tools.
    - Extending the solutions in different ways.
    - Creating configurations, custom tools (desktop), services (including interceptors), and custom applications (mobile and web).

Domain Base Data Models

When implemented within a user's organization, the Utility Network will actually be made up of one structure network and one or more domain networks. For example, the utility network for a gas organization could be composed of, a structural network (trenches, for example), a gas network, and possibly a cathodic (corrosion) protection network. Each of the domain networks would have its own set of feature classes, but they would all be within a single utility network. This means that a user can trace between the components. An electric utility, for example, could have transmission and distribution domain networks together. Users would be able to trace between the networks and maintain only one set of structures (transmission and distribution could use the same set of poles, towers, or manholes).

- Esri plans to provide base data models for each domain. Partners will expand on those base models, adding additional device types, rules, etc..
- These base data models will be simple but contain the framework for customers to add device types,additional attribute fields and the rules to go with them.

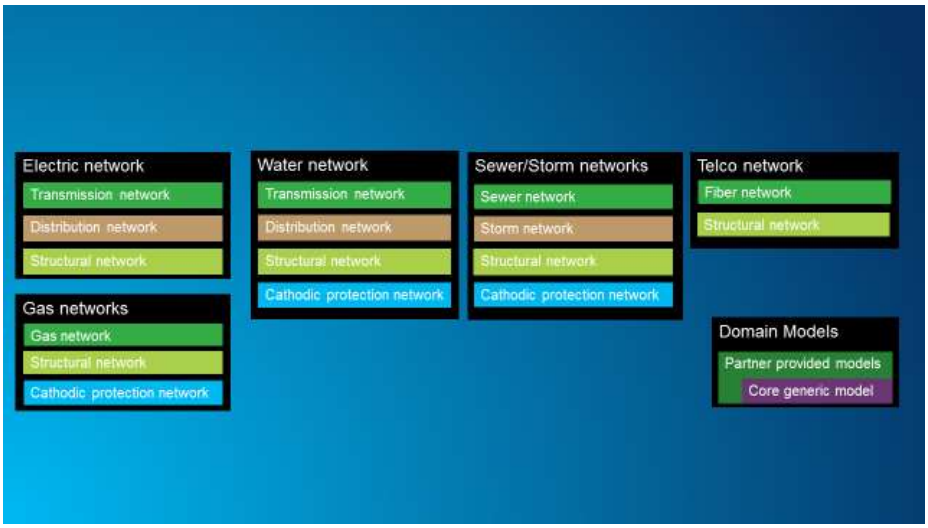

Figure 3: Base Data Models Delivered with Utility Network

What Follows

Some of the elements of the utility network (delivered with the ArcGIS Utility Network Management extension) are described in detail in the following sections:

- Connectivity
- Containment
- Structural Attachments
- Terminals
- Network Attributes
- Tracing
- Schematic Capabilities

- Validation

The following sections describe other new core capabilities that enhance network management with ArcGIS:

- Transaction Model
- Attribute Rules
- Editing with ArcGIS Pro

The final section will describe the migration process.

Connectivity

Connectivity is an important part of any network. With the Utility Network, connectivity will be based on x, y, and z coincidence by default. Adding the z component allows users to model things like vertical and stacked lines.

In addition to connectivity through x, y, and z coincidence, users will have the ability to create connectivity associations between devices that are not spatially coincident. Quite often, devices are offset for cartographic reasons or because organizations have chosen not to model all the details of their system (for instance, laterals or services).

Connectivity associations are also important when connecting to devices with terminals (discussed in a subsequent section). Terminals allow traditional point features to have more than one connection point.

Figure 4 illustrates the concept of explicit connectivity.

Connectivity principles are as follows:

- Utility networks support connectivity based on x, y, and z coincidence.

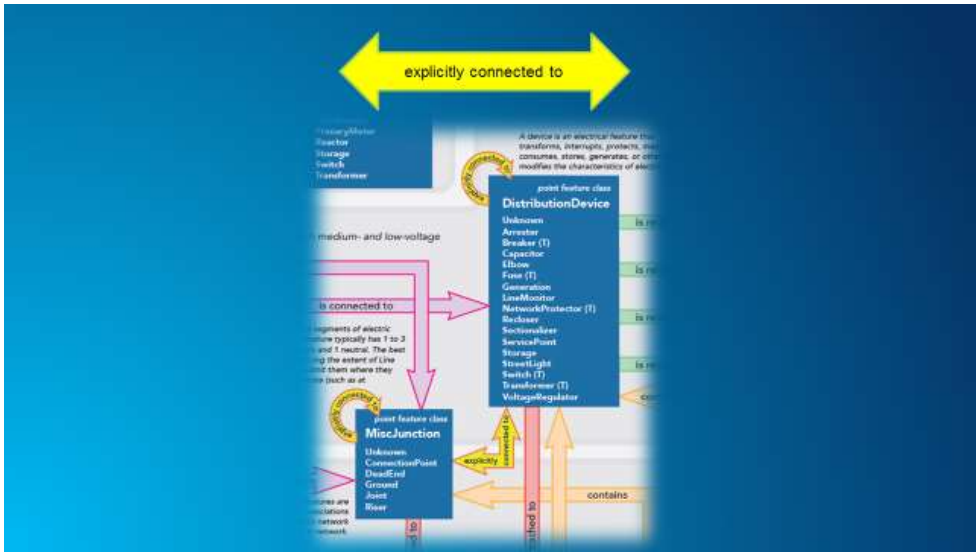

Figure 4: Connectivity can be implicit (as it is today) or explicit.

- Connectivity associations are used to model connectivity between two devices that are not geometrically coincident.
- Connectivity associations are defined between two point features
- Connectivity rules limit what can be connected.

Containment

Containment is the ability to model the devices inside other devices. For example, an electrical substation can contain the elements within the substation as features. Other examples include individual devices that are inside a vault, a switch gear, a metering station, or even a duct. Depending on the audience of map users, editors may want to depict the container device as a single object. They may also need to be able to keep track of what is inside and trace the individual devices. For other maps, editors will need to show the contained content in more detail so that workers in the field will know what is within a particular container, such as a vault.

Containment associations allow the user to create a relationship between a container and what is inside of it. Containers can be points, lines, or polygons. Rules in the data schema define the allowable devices that can be inside any container. On any map, users can decide whether they want to see just containers or the containers and their content. The content of a container can also be displayed on a separate map.

Containment principles are as follows:

- Containment associations are used to model the relationship between devices and structures or assemblies where the device is contained in the structure or assembly—for example, a valve inside a pump station or a transformer inside a substation.
- Only structures and assemblies can be containers. Devices can only be content, not containers. Which structures and assemblies are containers is defined in the data model.
- Structures and assemblies can also be content, as users can have containers inside containers. Many things can reside in a pump station or substation.
- Containment associations can be supported on point (a manhole), line (a trench), and polygon (substation boundary) features.

Figure 5 illustrates the concept of containment.

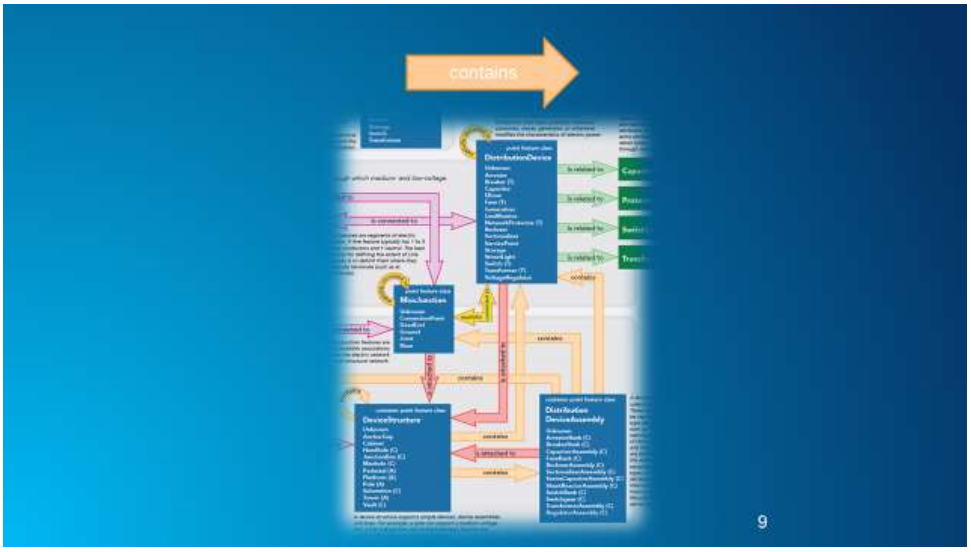

Figure 5: Containment allows devices to be contained in other devices.

Structural Attachments

Structural attachment is another type of association that can be created with the Utility Network. This type of association is used to model devices that are attached to other devices. For example, a power pole may have electric lines and cables attached to it, as well as devices such as transformers and fuses. When tracing a network, it is quite common for an organization to identify the structures that are associated with the returned set of devices. It is through structural attachment associations that this information can be returned to the user. In the current system, that association would only happen with a spatial query or relationship class.

Structures themselves can also be traced to determine the amount of available space for new lines or cables. For example, telecom companies may want to trace their conduits and ducts to determine whether there is enough space for a new cable.

Figure 6 illustrates the concept of structural attachment.

Here are the structural attachment principles:

- Structural attachment associations are used to model the relationship between devices and structures where the device is "attached" to the structure, for example, a transformer to a power pole.
- Structural attachment capabilities are specified at the asset type level.
- A structurecan only support either attachments or containment; it cannot support both.
- Structural attachment rules are used to constrain what can be attached.

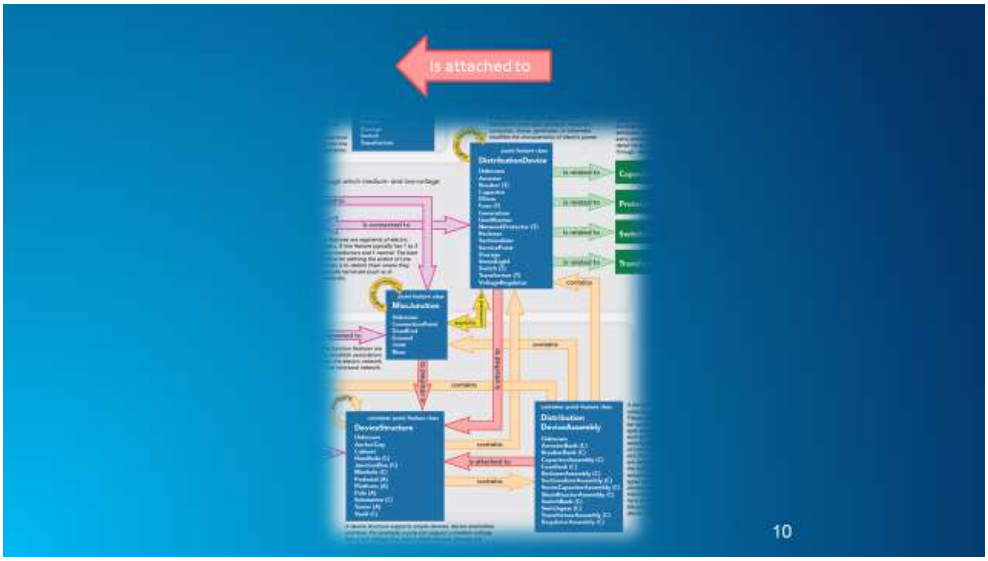

Figure 6: Devices can be explicitly attached to structures, such as poles.

Terminals

Terminals are important in that they allow users to work with multiple connection points on a single device. The purpose of supporting terminals is to allow for the modeling in the GIS of a more realistic representation of any given device. This representation can then be used to perform sophisticated analysis directly within the GIS, and for a less complicated integration between the GIS and other external systems for modeling, outage, and network analysis.

Terminals can also be used for complex switches and valves that may have three or more connection points, along with specific flow through the devices (depending on how they are configured).

One example is the tristate switch shown in figure 7. For this type of device, acceptable flow can be from A to B, A to C, or A to D. Terminals allow users to model tristate switches as a single device with a user-configurable domain value that specifies the flow.

The following are the principles of terminals:

- A terminal represents a connection point on a device.
- Terminals support more realistic modeling of devices. This is important for exporting data in the International Electrotechnical Commission (IEC) standard Common Information Model (CIM) format as well as sophisticated analytics without data extraction.
- Terminals are defined for certain devices. Not all devices need to support terminals.

- Terminals support devices that require a high and low side for analytic purposes and devices that require valences larger than two.

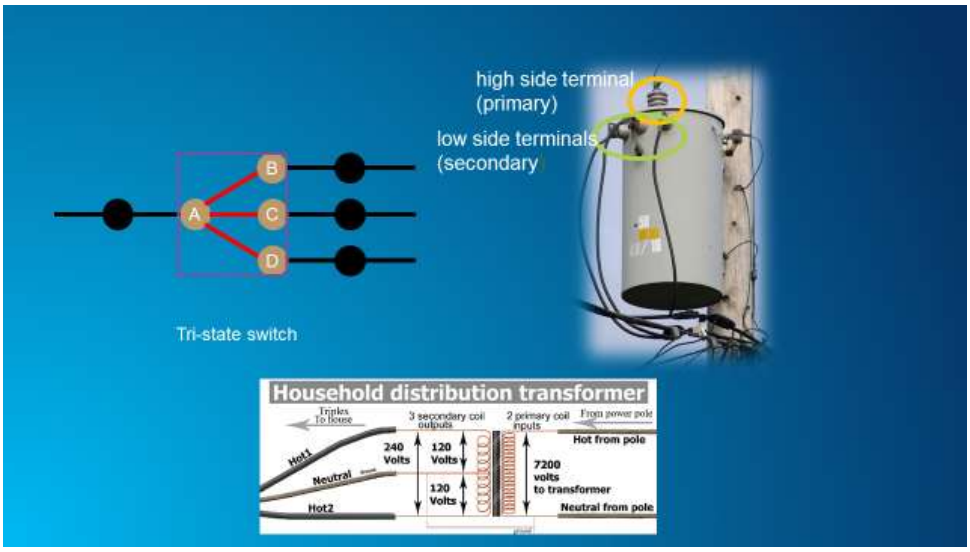

Figure 7: Terminals are explicitly modeled.

Network Attributes

Within the Utility Network, users will have the ability to specify that any particular field on a device participates in the network topology. One example of this would be the life cycle attribute. Organizations could configure a field with four statuses (proposed, in-service, abandoned, and under construction) controlled by a domain, and specify that it should be part of the network topology.

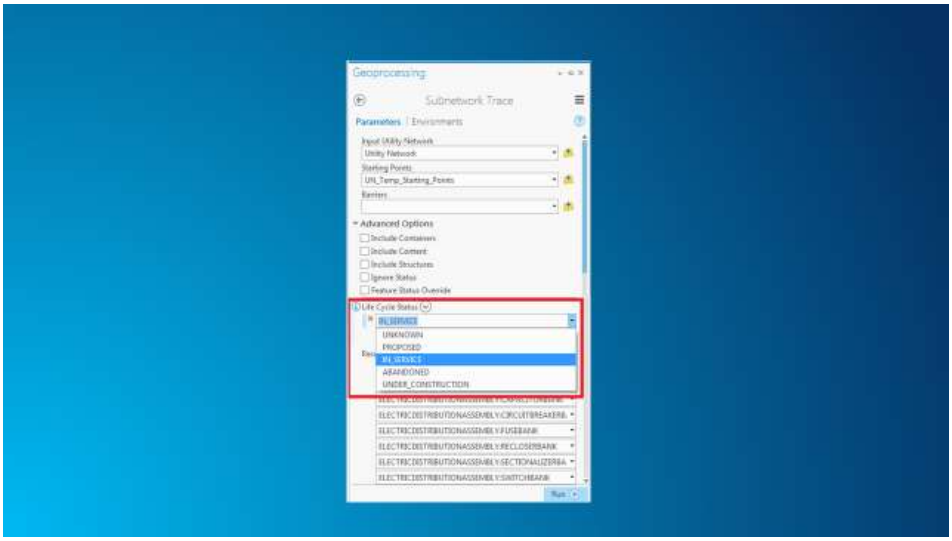

Figure 8: Users will be able to specify a life cycle attribute from a pick list.

Because the life cycle attribute could be added to the network topology, users will then be able to control the traversability of the network through the setting of this value. For example, an organization may want to perform most of its traces against the current active network, so users would choose to trace just those devices for which the life cycle attribute was set to "in-service."

Figure 8 illustrates the concept of using life cycle as a network attribute.

The network attribute principles are as follows:

- Organizations can define any numeric field as a network attribute that participates in the network topology A life cycle attribute would be an example.
- Trace operations will allow constraining traversability based on network attributes.
- Partner solutions can enable management of fields such as life cycle and domain-specific analysis around it.

Tracing

Tracing can be performed on the network in a variety of ways. As a standard function, users can employ a built-in geoprocessing tool to create a basic trace as well as to run a much more complicated trace on the setting of the various available options. Tracing options include the ability to perform connected, upstream, downstream, and subnetwork traces. Other options allow the user to specify weights to use with the trace (such as a life cycle attribute), indicate whether to include overrides, and control what is returned (i.e., whether associated structures should be returned). It is through configuration that users will have the ability to do more complicated traces such as upstream to protective device, pressure zone isolation, etc.

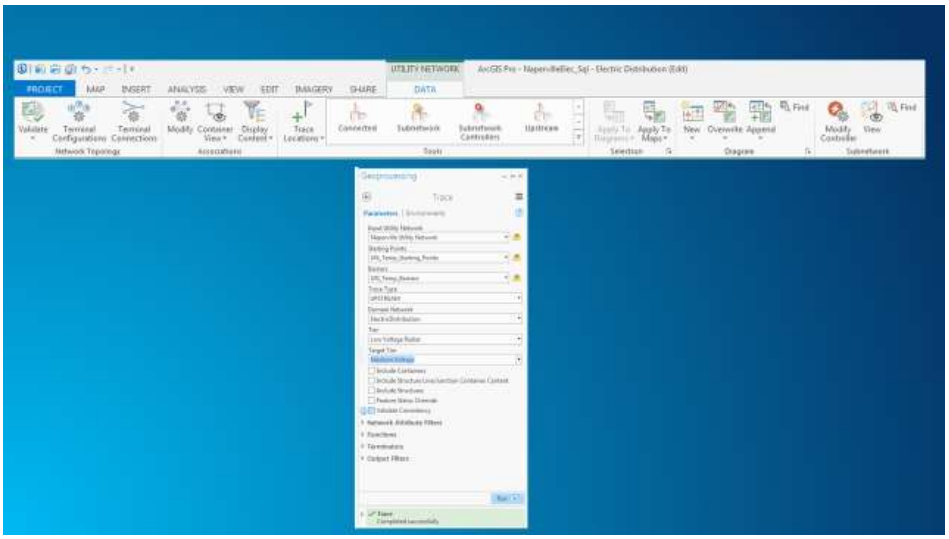

Figure 9: Tracing can be performed on the network in a variety of ways.

One interesting option is the ability to permit network attribute values to be controlled through an external table. The external table can be populated with values from SCADA or other systems to allow a near real-time representation of the network devices and the flow through them.

Figure 9 illustrates the trace options.

Tracing principles are as follows:

- Base analysis (tracing) is exposed in ArcGIS Pro as a GP tool, through the managed software development kit (SDK), and as Representational State Transfer (REST) endpoints in the Utility Network analyst service.
- Support is provided for network attributes and evaluators for constrained traces.
- Trace configurations can be saved with geoprocessing models to simply use

Schematic Capabilities

Schematic capabilities are built directly into the Utility Network in the form of network diagrams. When users create the new utility network, network diagram capabilities are built into that network at its inception. With network diagrams, users can create a schematic display of a selected set of features by using one of the many layout algorithms available with the core software. The diagrams that are generated can be used as a quick display of the connectivity, or they can persist as a formal alternative representation of the network.

Network diagrams are displayed in a separate view and, once opened, devices within them can be selected and queried and their attributes edited. In later releases, Esri will support a more complete editing environment for the network diagram.

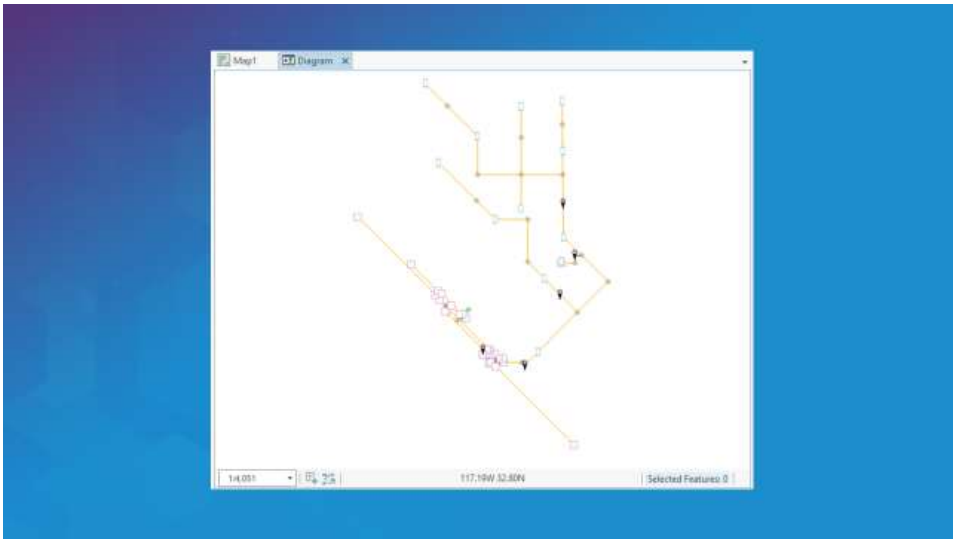

Figure 10: Schematic capabilities are built directly into the utility network in the form of network diagrams.

A long-term goal is to support a workflow in which new devices are added to the network diagram first to ensure that representations are correct from an engineering standpoint, with the geographic shape to be added at a later date.

Figure 10 illustrates a network diagram generated from a selected set of features.

Schematic capabilities principles are as follows:

- An integrated mechanism for utility network users to work with network diagrams is included.
- Preconfigured schematic diagramming capabilities are included as part of the core functions
- Default diagramming capabilities can be expanded to create simplified/enriched diagrams.
- Collections of layout algorithms to lay out diagram content are included.
- Users can control diagram persistence.
- Diagram owners can control access rights on persistent diagrams.
- Partners can extend capability with custom or configured layout routines.
- Network diagram layouts can be defined with subnetwork configurations for automatic updates with network changes.

Validation

With the utility network and new core capabilities of the platform, there are multiple ways the correctness of your data can be validated. The two main types of rules users will work with are:

- Network Rules – capabilities of the utility network to check for inconsistencies within the network data.
- Attribute Rules – new core capability of the platform to validate data and assign attribute values based on geometry, topology, and other attribute values.

Network Rules are in the form of both implicit and user defined rules. Implicit rules are ones that are built into the model regardless of the domain (electric, gas, water, telecom, etc.). These rules ensure things such as two lines of the same asset group/type will automatically connect. The other type of Network Rules is user defined rules based on associations employed in the data model. They include things such as specifying a medium voltage line can only connect to the high side of a transformer, or control values can be contained inside regulator stations. Dirty areas are used to track which features must have their Network Rules validated with the Validate Network Topology tool.

Attribute Rules are all user defined and come in three types:

- Calculation – attribute values can be automatically assigned based on an expression defined for the field. An example would be to use a sequence (next available value) to define the ID of feature. These rules are enforced during the editing process.
- Constraint – specify permissible attribute configurations on a feature. When a constraint rules is violated, an error is made and the update or adding of a feature is blocked. An example would that the length of a line feature must be greater than a specific value. These rules are enforced during the editing process.
- Validation – these rules are checked during a batch process applied to the database at a time of the users choosing. They are applied after edits have been stored, as they are often more complex rules that take extra computing time and would slow down workflows if executed while editing. This rule type will not be available with the first release of the ArcGIS Utility Network Management extension, but will be available with the second release.

Validation principles are as follows:

- There are several different rule types that work in concert to keep network data consistent.
- Both built-in and user defined rules are applied to network features with error conditions identified and reported to the user.
- Additional Attribute Rules can be defined to further ensure data correctness. Three different types of rules are available for the different scenario present while updating data.
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Transaction Model

As part of the project to improve network management capabilities, Esri is working on an updated transaction model to support utility and telecom company workflows. The transaction model will support three primary workflows including short transactions directly with the database; intermediate transactions, where editing supports undo/redo capabilities; and long transactions in high isolation, where named versions are created and edits are performed in the database over days and/or months.

The term *versioning* has been synonymous with the multiuser editing experience within ArcGIS for well over a decade, and the terminology will continue to be used, as users are more accustomed to creating, reconciling, and posting versions. However,

with the utility network, this process will be updated at the back end to provide a more efficient approach to meeting the same goals.

The transaction model (known as branch versioning) will be greatly simplified based on date and time stamps on each row of each feature. This simplification offers many advantages such as having far less overhead to maintain; increased performance; and the ability to support additional operations such as parallel posting and, in the future, partial posting or pre-posting.

Transaction model principles are as follows:

- New branch versioning model similar to the non-versioned archiving model, introduced with the sync model in ArcGIS 10.3, will be used.
  - The user experience will be the same as with the current versioning model.
- Three primary workflows will be supported:
  - Short transactions connected to the feature and utility analyst services
  - Feature service with sync for local editing of apps based on ArcGIS Pro or ArcGIS Runtime SDKs
  - High isolation (long transactions) connected through a feature service
- Benefits of the branch versioning approach are as follows:
  - No need to reconcile/compress nightly
  - Enhanced performance—Well-performing and scalable database queries
  - Temporal properties—Built-in history capabilities plus parallel posting and future support for partial posting

Attribute Management

Another aspect of the network management project that is separate from the utility network itself is the ability to automatically set attribute values based on an expression as users add, modify, and delete features. This capability known as Attribute Rules was introduced in the Validation section above. Regardless of how users edit (on the desktop, via a mobile device, or through a web app), configurable expressions can be executed to populate attribute values based on simple expression concatenation and spatial or topological queries.

A cross-platform scripting language (known as Arcade) will be used to define the rules to manage attribute values. These scripts can be used to create custom rules that can also be applied as features are updated.

Editing

Though the editing environment has to be somewhat generic, several capabilities Esri is working on will specifically help with the updating of utility network data. The initial client for the utility network will be ArcGIS Pro; these updates are going into that environment, but they will also be ported to the other clients (mobile and web) in future releases.

The snapping environment will be more intelligently based on the reading of the connectivity rules defined with the network being edited. As users specify the type of device to add, the connectivity rules for that device will be read from the network and the snapping environment will be set appropriately.

Improvements to the feature template environment will allow multiple features to be placed in bulk through group and preset templates. As these template types are used, appropriate connectivity, containment, and structural attachment associations will automatically be created. For instance, as shown in figure 11, a user could create a preset template that would add the SwitchBank shown with all appropriate associations created with a few mouse clicks.

Editing principles are as follows:

- Snapping based on defined connectivity rules
- Preset template option for repeatable configurations
- Automatic defining of containment, connectivity, and structural attachment associations during feature creation
- Templates available across the platform (available after the first release)

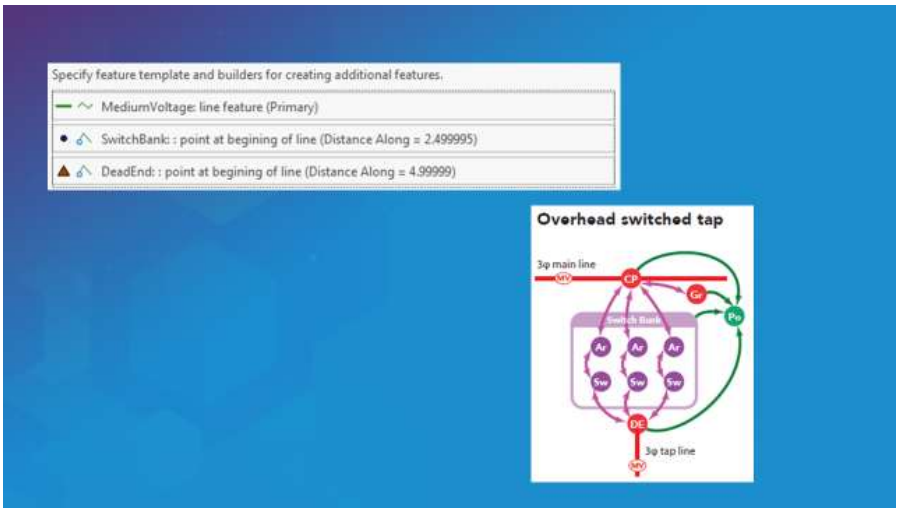


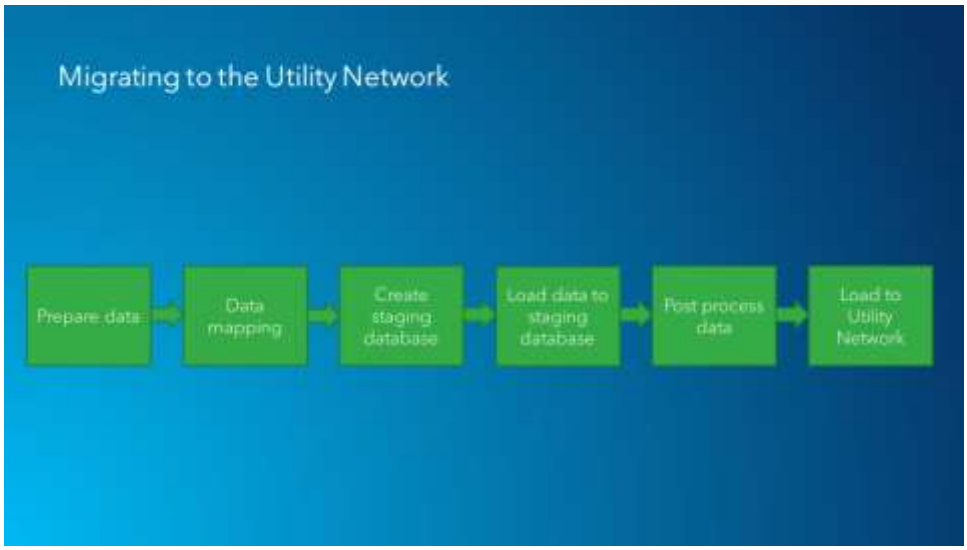
Figure 11: There will be an expanded set of editing tools.

Migration

As noted above, Esri will be providing base data models for end users. The models will be maintained by Esri.. These data models will come with a base set of tools and/or scripts to help migrate data from a geometric network into the new data model. Partners will also play an important role in data migration providing advanced data models and the tools to move user data to those models.

Esri is currently working on a white paper to help outline the process for data migration to the utility network. This paper will explain the process necessary to move network data, annotation, and other components to the new data model.

Figure 12 illustrates the process that will be detailed in the Esri white paper on migration



Summary

Esri is continually expanding the capabilities of the ArcGIS Utility Network Management extension and the utility network delivered with it.

Whether users view and query data, execute analysis, or edit the network, the capabilities to perform these actions will work across the platform.

The network management capabilities of ArcGIS consists of two parts:

- The ArcGIS Utility Network Management extension (which includes the utility network)
- New core architectural framework

Two key elements to this project are:

- Cross-platform capability makes the technology compatible across the ArcGIS platform.
- The technology is based on a services architecture.

The main features of the utility network are as follows:

- Connectivity—Users are able to both implicitly and explicitly connect devices, and all three dimensions are supported.
- Containment—Devices can be contained in other devices.
- Structural attachments—Devices can be explicitly connected to structural elements.
- Terminals—Devices can have multiple terminals.
- Network attributes—add fields such as life cycle to manage the states of the network.
- Tracing—Enhanced network tracing is supported.
- Schematic capabilities—Network diagrams can be created on the fly or persisted depending on requirements
- Validation—Rules-based validation is included.

The core architectural framework features include the following:

- Transaction model—A more comprehensive versioning technology
- Attribute management—More flexibility in managing attributes
- Editing with ArcGIS Pro

The path for users now is to:

- Update to ArcGIS 10.2.1 for Desktop. Update to the latest version of all other components of the ArcGIS platform.
- Implement the ArcGIS platform using ArcGIS Enterprise (formerly called Portal for ArcGIS), ArcGIS Online, or both.
  - Implement the model organization.
- Migrate as many older apps to ArcGIS Enterprise/ArcGIS Online as possible. Leverage the ArcGIS solutions available at solutions.arcgis.com.
- Keep up with all documentation about the new Utility Network and the associated core framework capabilities.
- Experiment with the new Utility Network when it is released.

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Understanding our world.

Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.

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