Map of the future

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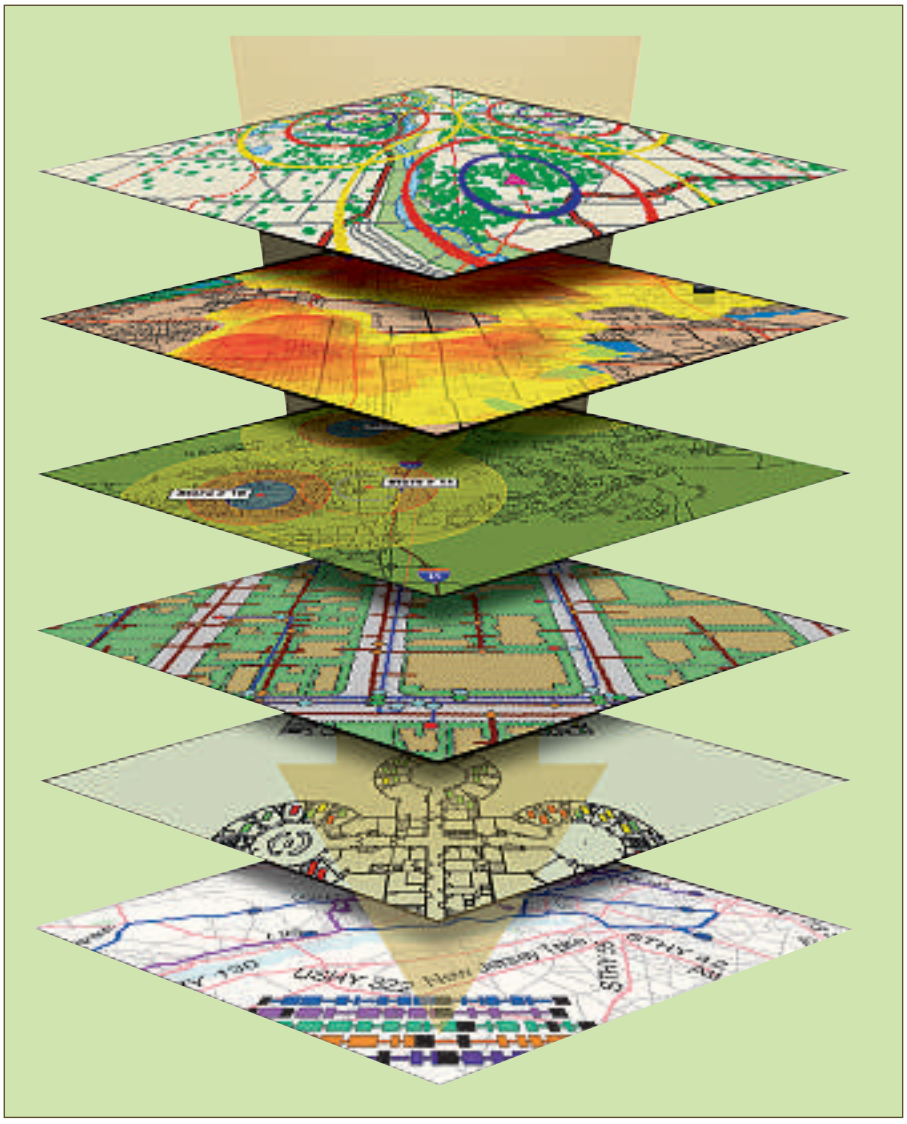
1	Unlike a paper map, where what you see is all there is, a GIS map can combine many layers of information.



ABB's Industrial^{IT} architecture enables users to access information that is relevant for the operation of whichever process it is supporting. In the electric utility sector, this could be geographical information, for example to give network operators an overview of important geospatial issues. ABB is enhancing its integration concept for this customer group by providing support for the ESRI Geographical Information System.

To understand the significance of integrating a geographical information system (GIS), it is worth first taking a closer look at GIS and at the functionality it offers.

A GIS primer

Put simply, a GIS combines layers of information about a place to provide users with a better understanding of that place. A GIS is mapping software that links information about 'where things are' with information about 'what things are like.' But unlike a paper map, where 'what you see is what you get,' a GIS map can combine many layers of information 1.

Just how the layers of information are combined depends on the intended purpose. One user may want to find the best location for a new store, another analyze environmental damage, and yet another search for patterns in a city's crime statistics 2.

Like a paper map, a digital map created by GIS has dots, or points, that represent towns and cities, lines that represent roads, and small areas representing lakes and woods. The difference is that this information comes from a database and is shown only if the user *chooses* to show it. The database stores the point's location, the road's length, and even the number of square miles covered by, say, a lake.

Each piece of information on the map sits on a layer that the user can turn on or off (ie, make visible or hide), as required. One layer could consist of all the roads in an area, a second layer could represent all the lakes in that area, and a third layer all the cities there.

The GIS' main advantage over paper maps is the way it empowers users by letting them select the exact information they need. [1].

The Statnett project

Statnett, Norway's national grid operator, is in the process of implementing a new GIS based on ESRI software that will be implemented by Geodata, the local ESRI supplier. A key requirement of this project is that the new GIS system should be closely integrated with the IFS computerized maintenance management system (CMMS). Statnett is also using ABB SCADA/EMS systems for overall systems control of their network. Statnett has chosen Industrial IT from ABB as the integration vehicle. This will enable the GIS to be seamlessly integrated with the CMMS, allowing users to find an object on the map that they select in that system, or pull up maintenance information on the network components from the GIS map. Thus, a planner sitting in front of the GIS map can easily access information such as previous work on a line tower. Similarly, maintenance workers who have received a work order in the CMMS can view a map showing the location of the component in question by means of a simple mouse-click.

> The main advantage of a digital map created by GIS is the way it empowers users by letting them select the exact information they need.

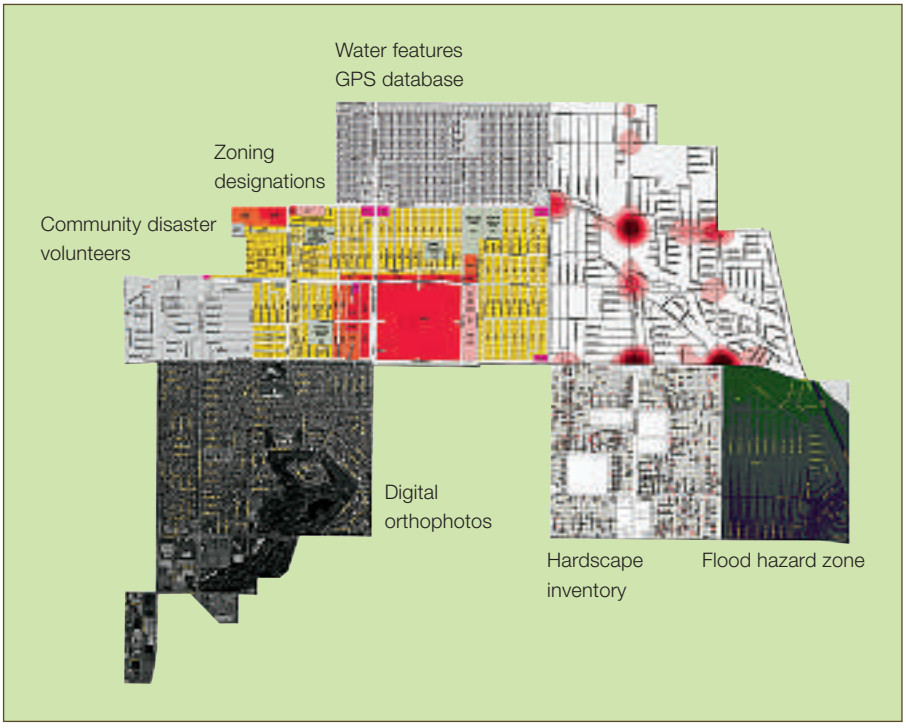
The GIS/CMMS integration forms a good basis for possible later integration with the ABB SCADA/EMS system. Full integration of GIS, CMMS and SCADA via Industrial IT would allow Statnett to seamlessly navigate between all three systems.

The utility integration concept

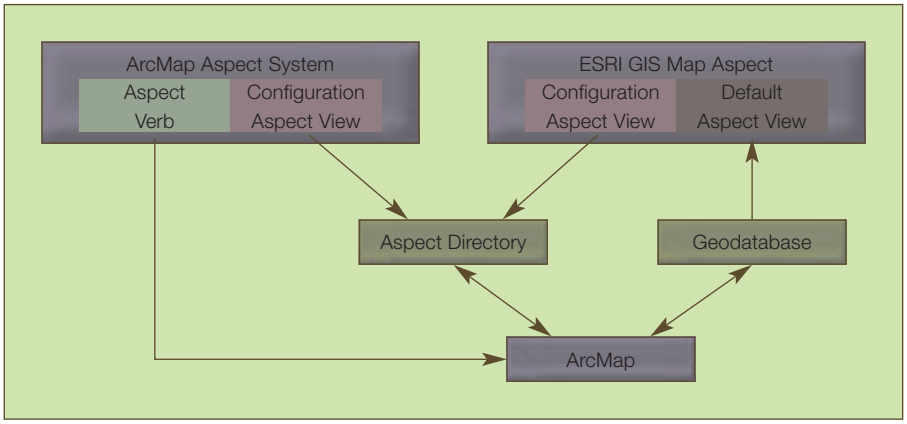
Integrating the ESRI GIS software with Industrial IT extends ABB's utility integration concept, providing seamless integration with operational SCADA systems as well as with maintenance management systems. This has numerous benefits. For example, the user can access maintenance information related to a specific fault directly from the SCADA system; or show the planned work orders on a power line section directly from the GIS map; or access the operational status (SCADA) from the GIS map. This seamless integration will, in effect, allow the user to access all relevant information about the power system components, irrespective of where the information is kept. The user will then be able to make fast decisions in critical situations. The major power system outages last year have highlighted the need for making the right decisions in time-critical situations.

Some of the applications which would benefit from the Industrial IT integration of a GIS system include, but are not limited to, visualization of power system stability, localization of power system faults and outages,

2	Just how the layers of information are combined depends on what the user wants – perhaps to find the best location for a new store, or search for patterns in a city's crime statistics.



3 Relationship between GIS Aspect Systems, ABB's Industrial^{IT} Aspect directory, the ArcMap application and the geodatabase



and visual indication of inventory levels based on actual geographical coordinates.

Technology and configuration

Integrating ESRI's GIS system with ABB's Industrial IT involves implementing Aspect Systems. An Aspect System packages functionality so that it can be modeled as Aspects of an Object in the common ABB architecture, ie using the powerful Aspect Object technology.

> Applications that would benefit from Industrial IT integration of GIS include visualization of power system stability and localization of faults and outages.

Two GIS Aspect Systems have been implemented:

- *MapControl Aspect System*. This Industrial IT user interface displays relevant data with a spatial reference and provides some of the common functionality of a GIS, such as pan/zoom, de-cluttering and topological overlaying. It allows a user, eg an operator, to view a map of an object from his workplace and is implemented using ESRI's MapControl product.
- *ArcMap Aspect System*. This enables context-sensitive viewing and launching of Aspects from within ArcMap – the standard ESRI application – and also enables context-sensitive launching of the full ArcMap application from other applications.

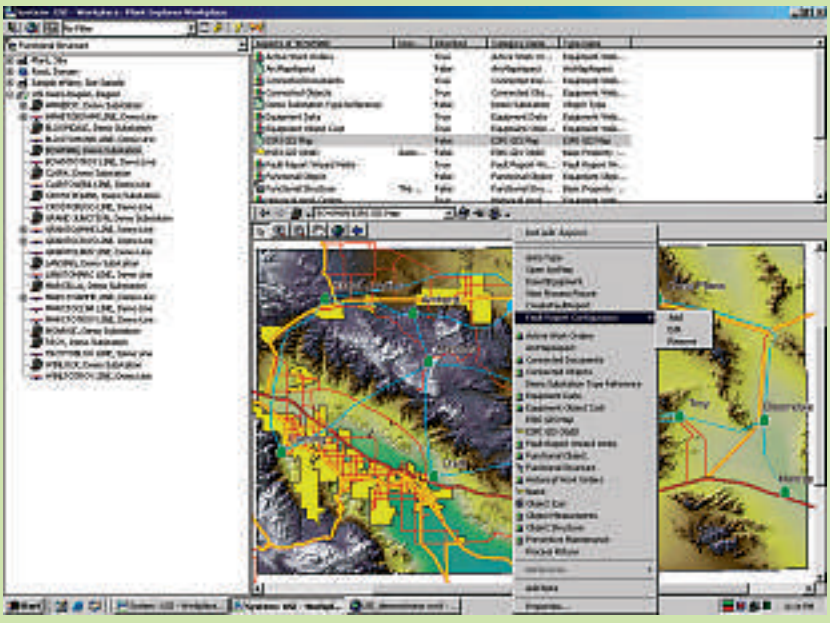
The two Aspect Systems and their relationship to the Industrial IT Aspect Directory, the ArcMap application and the geodatabase is shown in 3. Each object in the Aspect Directory that has a corresponding object in the geodatabase, is assigned a special ID Aspect that provides the cross-reference between the GIS and other applications.

The following sections give examples of uses for the ESRI GIS Map Aspect System and ArcMap Aspect System.

Operator support with MapControl

Since MapControl provides 'read-only' access to GIS information, it is ideal for operators whose main need is to be able to act upon the objects on the map rather than modify the underlying object features, such as location and connectivity of objects in the GIS. For example, an operator might want to color-code network elements to reflect limit violations, show dynamic measurements at certain geographical locations, or indicate the dynamic status information of GIS objects.

4 MapControl Aspect view within Plant Explorer, showing the context menu functionality



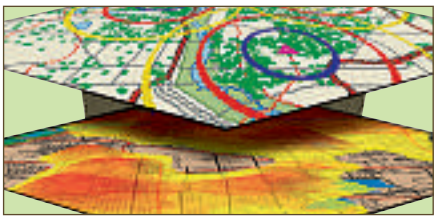
Navigation from the ESRI GIS Map Aspect view is made possible by context menus 4. Right-clicking on a map feature will reveal a list of the relevant Aspects of the Object in a context menu. The right-clicked object is color-coded (selected mode) for easy location. Any Aspect associated with the selected Object can be launched from the context menu.

ESRI and ABB are working closely together to enhance features of this navigation system that will support utility network asset management.

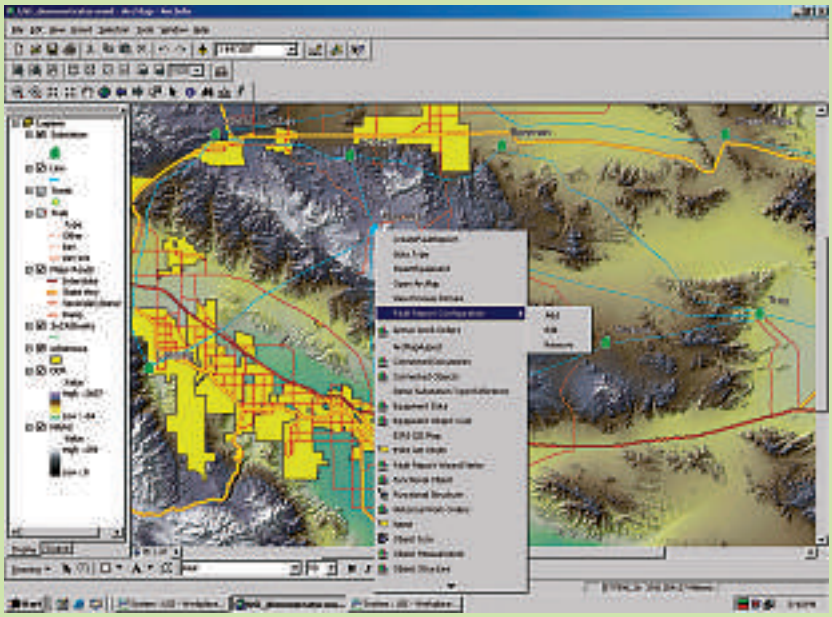
Planning and maintenance support with ArcMap

ArcMap is ESRI's central desktop application, and is used for all map-based tasks, including cartography, map analysis and editing. ArcMap allows users to add, modify and delete map attributes, as well as analyze map features using ESRI functions. A typical planning and maintenance process for which ArcMap is ideal is checking maintenance logs and documents for a particular piece of equipment, for example when designing the layout of an electrical distribution system.

Right-clicking on a map feature in ArcMap launches this object's context menu, which lists the relevant Aspects 5. The map feature is highlighted for easy identification. This is particularly useful when right-clicking on a relatively crowded or dense area in the map view.



5 Aspect context menu within ArcMap



A fruitful collaboration

ESRI and ABB are working closely together to further develop and enhance features of this navigation system that will support utility network asset management, particularly in the area of data consistency.

Seamless integration of key IT systems for planning, operation and maintenance is seen to have numerous benefits for utility customers. Simple mouse-click navigation will allow them to operate more efficiently by giving them access to all relevant information about their assets.

ABB is also utilizing ESRI base technology in a number of other products, such as network planning and data engineering tools.

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Reference

[1] An Internet Guide to Geographical Information Systems: www.gis.com.