Industrial^{IT} and the utility industry

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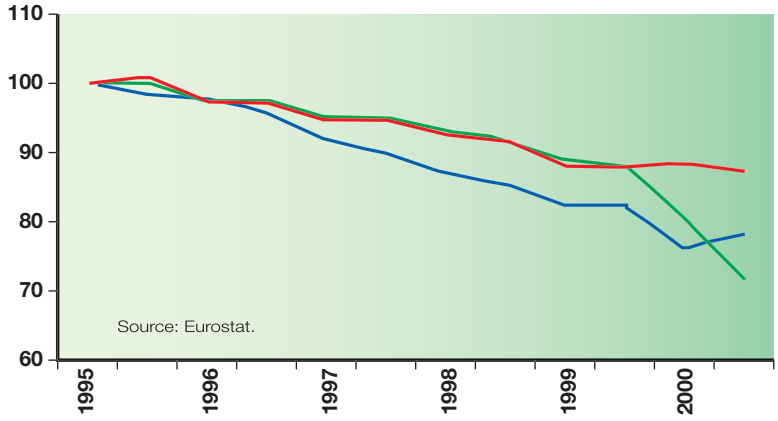
ABB's Industrial^{IT} has been discussed often in the pages of *ABB Review*, and its benefits, especially for automation, manufacturing and production applications, have been explained in detail. But what about the utility industry? How is Industrial IT contributing to this important area of ABB business and how can the unique business environment of the utility industry profit from it?

The utility industry is undergoing a fundamental transformation. The change from a vertically integrated industry, often under national control and with only limited competition, if any at all, to a fully competitive, deregulated industry is dramatic in all its implications. On top of all this, the product involved, electrical energy, is vital to the development of nations. The US Department of Energy has put this clearly into perspective by stating:

"Electricity is a cornerstone on which the economy and the daily lives of our nation's citizens depend. This essential commodity has no substitute. Unlike most commodities, electricity cannot easily be stored, so it must be produced at the same instant it is consumed. The electricity delivery system must be flexible enough, every second of the day and every day of the year, to accommodate the nation's ever-changing demand for electricity. There is growing evidence that both private and public action is urgently needed to ensure our transmission system will continue to meet the nation's need for reliable and affordable electricity in the 21st century."

IT solutions will be a key area for utilities in this new and fast-changing market. Only IT solutions can successfully provide enough flexibility and intelligence to accommodate changes in the market such as price erosion, investment uncertainty and demand for higher reliability.



1 Electricity price development for industrial customers in Europe 1995–2000 (1995=100). The blue, green and red curves assume a 100 %, <100 % and <40 % market liberalization, respectively.

Price erosion

The introduction of competition has, in most cases, led to significant reductions in electricity prices, as in Europe, where the electric utility industry has been undergoing restructuring for the last ten years 1.

Industrial customers are usually the first to benefit from increased competition. Subsequent opening of the individual consumer market is accompanied by strong pressure on electricity prices across the board; in Sweden more than 30% of customers have changed their electricity supplier since reform was introduced just a few years ago.

The consequences of the increased competition are that the utilities have to better utilize existing investments, which are very capital intensive, to enhance their value, and also ensure the highest possible return on future investments. At the same time, operation and maintenance costs are becoming more critical.

Investment uncertainty

In a non-competitive environment, planners had only to consider the load growth per region and structure the investments accordingly. The regulatory framework and the customer base were stable and this made planning easy. The main focus was on security of supply, and costs for investments, operation and maintenance were simply passed on to the consumer.

With the unbundling of generation, transmission and distribution activities, totally new conditions were created for the utilities. Competition is normally introduced in the generation business, whereas transmission is often left regulated. Different models are applied to distribution, but as a rule the regulator pressures the distributor to be competitive. This has resulted in a large increase in investment uncertainty.

Electricity is fast-becoming the largest traded commodity in the world. The keys to success in this marketplace are the ability to master real-time market data and information about the capabilities and limitations of resources, and having efficient tools for asset management.

One initial reaction of the utilities has been to cut back on investments, but this is not a sustainable strategy. Public response to some spectacular blackouts and supply shortages has resulted in pressure for more stringent regulation.

Reliability expectations have grown

The traditional utility could provide a secure supply of electricity since cost was not considered to be too important. However, in the new competitive business environment, strict cost control has to be given equal attention. Something else making supply security increasingly important is the fact that the loads are becoming more and more sensitive to supply quality.

Inadequate reliability not only puts a company's image on the line, it can also damage its balance sheet by making it liable to pay penalties to customers.

How Industrial^{IT} supports utilities in the new business environment

Information

The most fundamental prerequisite for

all performance enhancements based on IT is access to information. However, the traditional mix of mutually incompatible and slow information creation, storage and retrieval methods simply have no place in the new, fast-changing energy world.

ABB's Industrial^{IT} concept will make it possible to create, store and retrieve, in real time, all the information that a system will need to operate as efficiently as possible. There will be none of the barriers that have traditionally separated information provinces, such as mechanical and electrical, technical and business, operation and maintenance, and software and hardware.

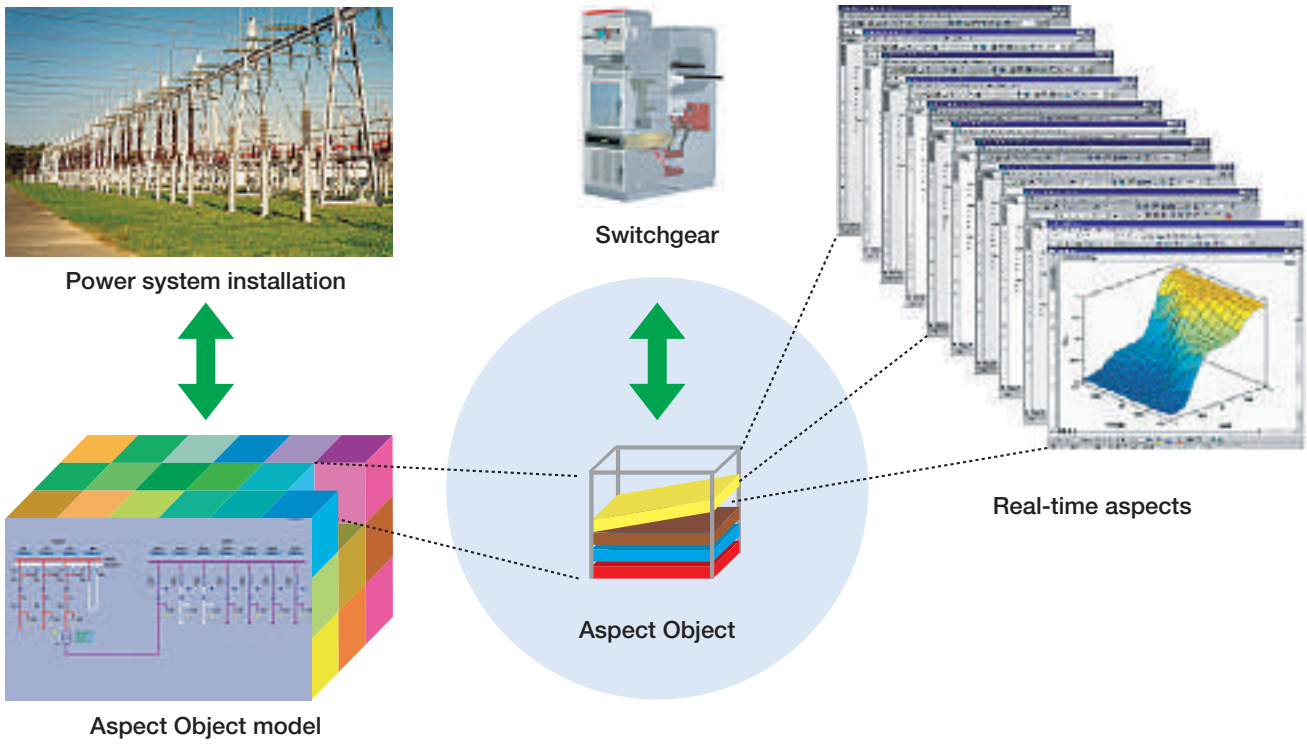
The key to ABB's Industrial IT is Aspect Object™ technology [1]. An *Object* is defined as a software container which keeps together all the characteristics, called *Aspects*, of a piece of equipment, be it switchgear, a transformer or any other device. Aspect Objects can be combined to model a complete station, as shown in 2.

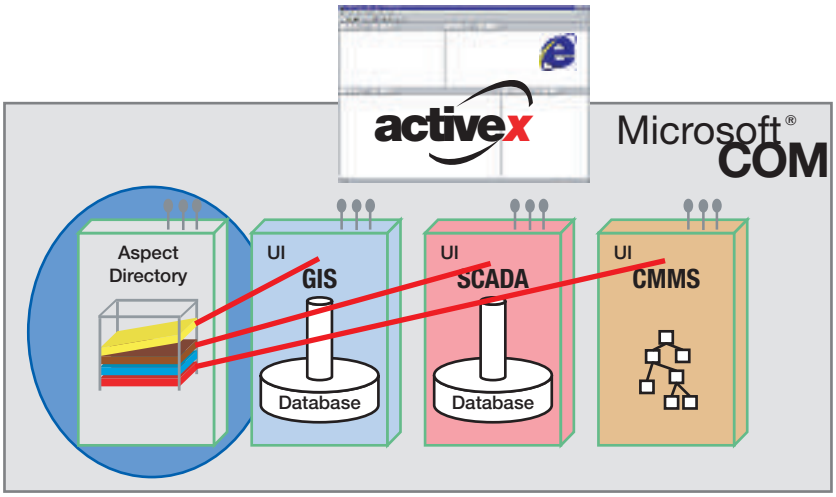
When multiple products are combined to form a system or solution, physically putting each device into place is the easy part. The difficult part is collecting, and keeping up-to-date, all the related information (configuration, drawings, maintenance records, etc), as this is often stored in different formats and in different locations.

Industrial IT from ABB will change this. Once the physical device is put into place, the operator can simply copy and paste the model Aspect Object into the overall system monitoring and control strategy. No matter where each real object is deployed, one 'click' on the model Object provides a link to its Aspect information.

Although certain Aspects (drawings, instructions, etc) may not change over time, others (eg, configuration, efficiency, cost of ownership) must be frequently updated. The Industrial IT architecture provides a way to automate this

2 The Aspect Object is a key element of ABB's Industrial^{IT} architecture.





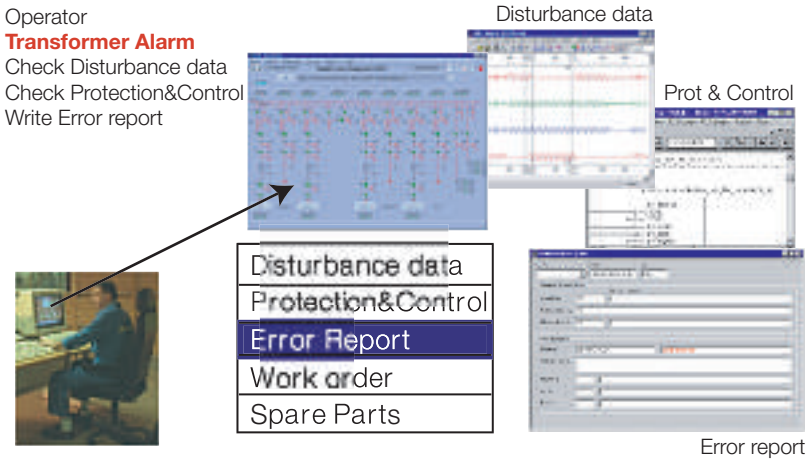
3 Applications communicate via the Aspect Directory

process, and to help various devices 'learn' from each other by exchanging real-time Aspect information.

Integration

The Aspect Integrator Platform (AIP) – ABB's common Industrial IT architecture – makes it possible to integrate many different *applications* as Aspects, allowing them to be seamlessly linked in real time. It is even possible to integrate the applications without any changes and it is not even necessary for the different applications to be aware of each other. In addition, they could be from ABB, but could just as well be any third-party or customer application such as Word, Excel, ERP, a web camera, a Computerized Maintenance Management System (CMMS) 3, etc.

4 Integrating a SCADA/EMS system with a Computerized Maintenance Management System allows an operator to issue an error report in the CMMS when something happens in the network.



This, in turn, engenders entirely new conceptual solutions. It is well known from other industries that when components, systems and solutions become adapted for integration, totally new and much more efficient solutions are made possible.

Normally, the first step in integration is to copy the traditional products and systems into one common system. Since the different functions can share interface and computing capability, a saving in both hardware and software is certain.

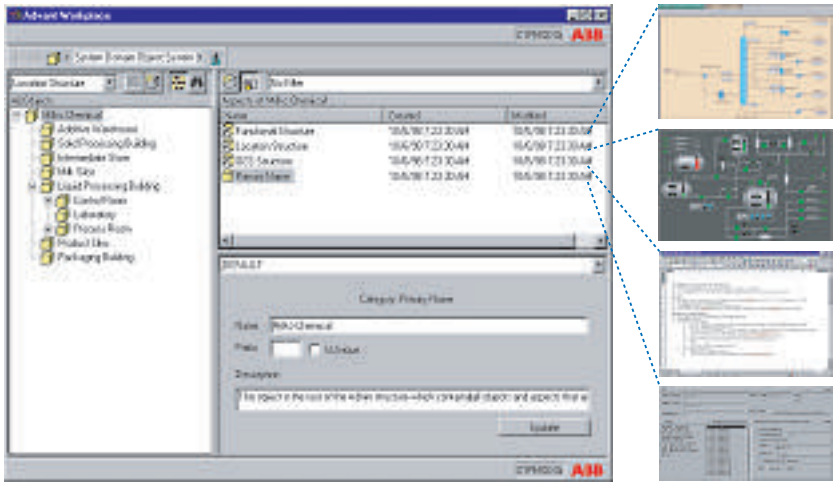
The second step in the integration is to start utilizing the available information to build completely new functionality in the integrated system. The biggest advantages arise from combining the integration with added functionality and optimization.

The integration functionality of the Industrial IT architecture is unique in that it allows a logical integration of independent applications without requiring any changes to them. A practical example of this would be to integrate a SCADA/EMS system with a CMMS, thus allowing an operator to issue an error report in the CMMS when something happens in the network. The report can be initiated by just right-clicking with the mouse on the faulty object and then selecting the CMMS aspect 4.

In the ABB Object architecture, such flexibilty is provided by an *Aspect Directory* which interfaces between applications. When an application is installed in the system it registers all

interfaces that it supports with the Aspect Directory. When any application wants to perform an operation that involves action by other applications, it queries this Aspect Directory for references to all interfaces that implement the operation, and then invokes these interfaces, one by one.

To copy and paste an object, for example, all applications that implement Aspects defined for the object must be involved and perform their part of the operation, each application copying and pasting its Aspect respectively.



5 The Plant Explorer lets users navigate through the information in a way they feel familiar with.

Industrial IT based automation platform

ABB utilizes the Aspect Object technology both as an integrated part of the new automation platform and as a solution for integration of hitherto independent applications, thus providing an improved workflow for ABB customers.

The automation platform will span traditional functions such as DCS, PLC, SCADA and substation automation functionality. In the platform, the Aspect Object system will be used to keep track of all information about an object connected to the system, eg a protection relay, where the different Aspects might be an alarm list, interlocking data, documentation, graphics, etc.

Importantly, the operator is provided with a tool with a familiar 'feel' 5 for easy navigation through the information hierarchy. This 'Plant Explorer' is a browser that allows navigation through the various structures and viewing of the Aspects defined for each object.

Optimization by integrating solutions

Advantage may be taken of the added functionality arising from an integrated solution to optimize the performance of the entire system. This opens up spectacular possibilities, such as combining real-time information and added functionality. For example, starting from

- Production cost forecasting
- Capability limitations in production, transmission and distribution
- Static and dynamic capability, with margins in the system for both
- Information needed for demand-driven maintenance
- Information needed for disturbance prevention and mitigation

it is possible for users to take this information and start combining as follows:

- Market prices, current and future. How can I combine this with production cost forecasting?
- Demand forecasting. How can I use this information together with capability limitations, maintenance scheduling and disturbance prevention?
- Maintenance scheduling. How can this be combined with market pricing, demand forecasting and capability limitations to minimize the consequential cost of maintenance?
- Capability limitations. How can this be combined with static and dynamic capability margins to ensure maximum utilization without reducing the reliability?

Industrial IT certification

To ensure all ABB products adhere to the Industrial IT architecture, a certification program has been launched. By

mid-2002 over 10,000 ABB products were certified at the basic certification level. It is planned to certify *all* ABB products, including all power technology devices such as transformers, switchgear, etc., to this level by the end of the year. More advanced certification levels (Information, Connectivity, Integration and Optimization are foreseen) as well as certification of solutions will follow. The certification program is open for third-party products and it is ABB's ambition to establish the Industrial IT architecture as an industry *de facto* standard.

Industrial^{IT} for Utilities

Industrial IT is an overall strategy for ABB with major benefits for the utility industries:

- A new, modern automation platform in which Aspect Objects is an integrated feature and which will be introduced for power plants, water applications and substation control and protection.
- A unique integration architecture, called the Aspect Integrator Platform (AIP), that will make it possible to integrate existing utility applications.
- A certification process that guarantees that ABB, and many third-party, products will fit seamlessly into the Industrial IT architecture.
- A new transparent naming strategy that makes it easy to understand ABB's product and solution offerings.

Structured customer offerings

All offerings compliant with the Industrial IT architecture will have a consistent naming structure that is descriptive in its nature. That means that names will directly guide the reader to whatever application or use is addressed. For ABB's utilities business, the naming policy has been applied according to the following structure (with examples):

- Solution Portfolio (Industrial IT for Power Generation)
- Solution Suite (Industrial IT for Combustion Management)
- Solution (Industrial IT Carbon in Ash Monitor)
- Product (Control^{IT}, Process Controller, AC 800M)

Market introduction

Industrial^{IT} for Utilities will be introduced to the market in a step-wise fashion, with products and solutions being gradually certified to comply with the four levels of Industrial IT compliance. The first, smaller power plant and water automation systems based on the new automation platform are already up and running. Next steps will be large power plants and water applications, substation automation, network management, and so on.

A key goal in the introduction program is to develop new solutions around the Aspect Object architecture. Several of these projects target the utility area, and exciting new solutions in areas such as wide area protection, lifetime-based decision support for power plants and integrated preventive service tools are in the pipeline

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Reference

[1] The ABCs of Industrial^{IT}. ABB Review 1/2002, 6–13.