TRANSPARENCY

Engineer[IT] Documentation Assistant
makes complex documentation simple

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Complex industrial products tend to be accompanied by a mountain of documents, and an electricity substation is no exception. Adding to the complexity, this vital information is usually from different sources and is in a variety of paper and CD formats and standards, making compilation and retrieval difficult.

To make life simpler for industry, ABB has developed the Engineer[IT] Documentation Assistant. Part of ABB's Industrial[IT] architecture, this new tool simplifies and automates documentation generation and retrieval.
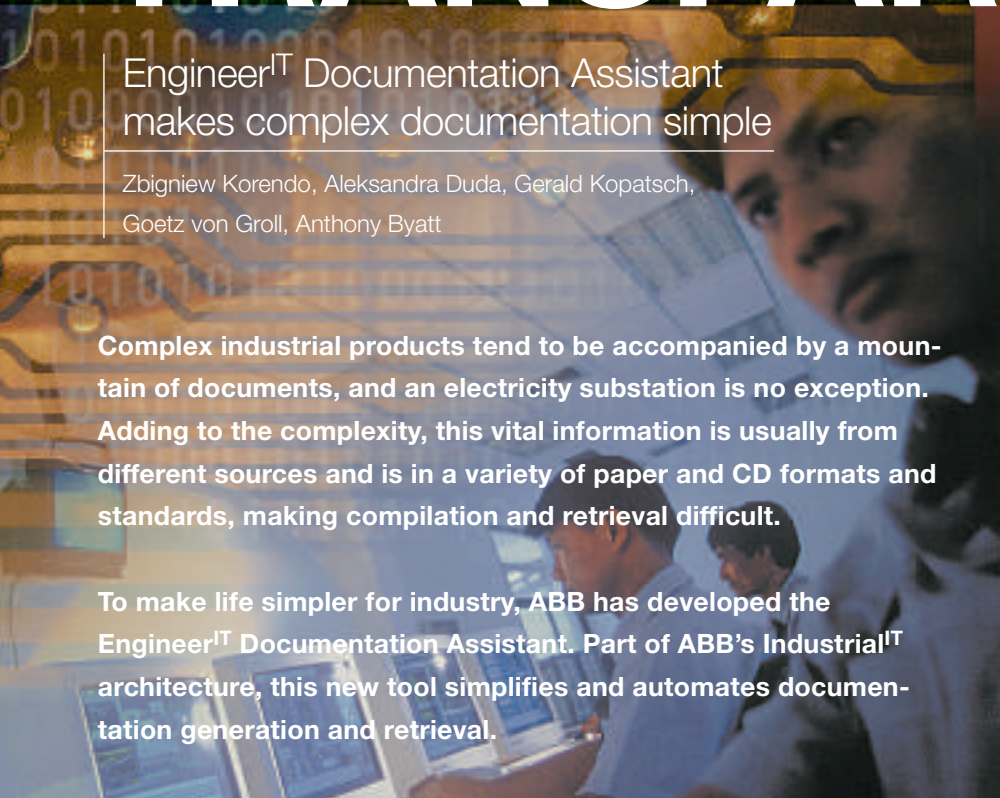
Designing a substation doesn't sound too complex: switchgear to handle the voltage coming in, a transformer to step the voltage up or down and some more switchgear to handle the power being sent out to wherever it is needed. But it isn't quite that simple: each of these three stages encompasses a significant number of devices for essential functions like power switching, control, protection and metering. To cater for these tasks ABB supplies a wide range of products, such as power transformers, circuit-breakers, instrument transformers, surge arresters, control and protection relays, MV switchgear, capacitor banks and cables.

It doesn't stop there, either: substations also need steel structures, buildings, and auxiliary systems like air-conditioning or fire-extinguishing equipment. Usually, third-party suppliers provide these components.

Designing each new substation from scratch would be like re-inventing the wheel, over and over again. And as substations account for about 25 % of the total capital cost of a transmission system, that would be an expensive business. How can it be prevented?

Simplifying substation design
ABB offers a number of modularized substation layouts as turnkey solutions. Their technical design is based on a

pre-selected set of electrical equipment and can be customized using ABB's substation design system. Although this means that the substation designer hasn't got *total* freedom, it doesn't really matter as many cases are adequately covered by the pre-defined layouts.

In addition, pre-assembly cuts delivery time by half and allows testing to be completed in the factory instead of on-site. The package approach also helps ABB reduce the number of major vendors involved in creating a substation from more than 30 to fewer than ten, increasing quality.

Information mountain

ABB substations, like most modern, complex products, come with a huge amount of documentation: for asset life-cycle management, substation operation, service and maintenance, to name the more obvious. But that's just the beginning; starting from the individual component datasheets, through system design, configuration, installation and commissioning, to operation, and finally decommissioning, each stage adds new data to the ocean of information accompanying the final product. All of this information must be fully available throughout the substation's life cycle.

1	Solution certification using Engineer[IT] Documentation Assistant
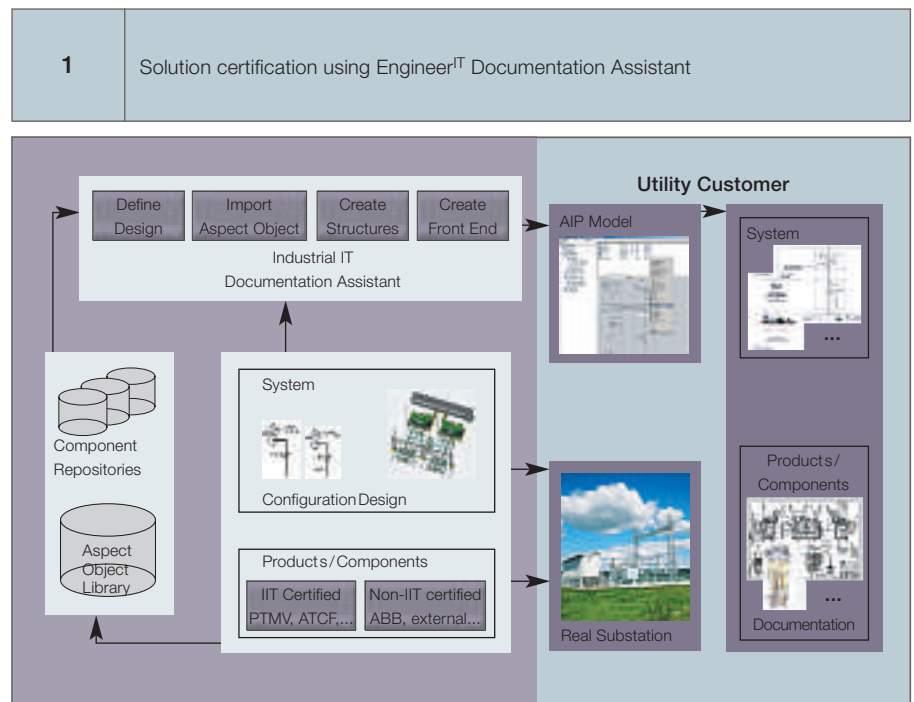
Hard to find

Much substation documentation today is predominantly paper-based, with some on CD. Although easier to search, CDs do not solve the fundamental problems of distributed access, easy navigation, user-customized views and update management. Not only that, but different sub-suppliers provide documentation in different formats, to different standards. Neither is it obvious how this data should be structured: by document type (eg, all electrical drawings), by supplier, by product or by medium?

Bringing all this data together is an arduous, time-consuming and error-prone task. What is needed is a flexible information system that allows maintenance manuals or asset identification numbers to be retrieved within seconds by clicking on the corresponding apparatus in a single-line diagram.

And this is where the central concept of ABB's Industrial IT – the Aspect Object – comes in.

Aspect Objects

Aspect Objects can represent anything from installed equipment, like robots, vessels, valves, transformers and switches, to products, like cars, pharmaceuticals and even electricity. But Aspect Objects can also be less tangible, for example sales or manufacturing orders, sometimes blueprints for a certain product. All information on an Aspect Object (its 'Aspects') can be obtained by clicking on its icon. An Aspect is a truly universal 'information carrier' with data types ranging from simple document links like design drawings, control diagrams, maintenance information, loca-

tion and quality standards, through business data like a component serial number or order number, to links to a relevant record in the SAP system or real-time measurements and monitoring. In the case of ABB substations, the Aspect Objects could be, for example, instrument transformers, protection relays or subsystems like MV switchgear.

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Because these Aspect Objects are designed with standard 'interfaces', the task of documenting the substation becomes very easy; just a matter of collecting the Aspect Objects appropriate to the substation design and snapping them together, like Lego© bricks; information collection is thus easily automated. The reusability advantages are self-evident.

Time is saved, too, with the logical organization of the information: different users can structure the information display to suit their individual needs.

One structure is simply not enough to manage the complexity of a substation. For example, substation operators need a functional structure while maintenance staff require a location-based structure. Industrial IT supports a multitude of such structures – no competitor offers this – giving each user a hierarchy that meets his or her needs. Regardless of the arrangement, the architecture works in the background to maintain the integrity of the relevant Objects, whatever the structure or user perspective.

Engineer^IT Documentation Assistant

The Aspect Object acts as a standardized documentation container, like the traditional binder. But how is it that an ABB substation's Aspect Objects corresponding to isolated Industrial IT Enabled products can actually be combined into a compound Aspect Object representing the entire substation? And

what if there are components from non-ABB suppliers?

The answer lies with the Engineer^IT Documentation Assistant. This is the tool responsible for compiling the Aspect Object for the entire substation from all the available information **1**. The scope of this powerful software covers the whole process of substation engineering:

- Defining design specifications (input model)
- Identifying and importing product Aspect Objects
- Creating Objects representing non-certified products
- Creating data structures
- Downloading documentation to the local PC
- Burning an Industrial IT Enabled substation CD

All the information included in the individual Aspect Objects is also linked and structured, thus simplifying document generation for the substation as a whole. This concept, known as Aspect Object modeling, is the basis for the Documentation Assistant. After the Aspect Object representing the substation is built, it can easily be reused.

Along the way, the Documentation Assistant communicates with a number of external applications:

- ABB Library – the source of product Aspect Objects and underlying documentation

- ABB substation design system – the source of the substation model with design specifications
- EDMS – the source of the solution level and third-party supplier's documentation

The customer may then either install this Object in his Industrial IT environment or access documentation directly from the distribution CD using the enclosed Aspect Object Viewer (AOV) application (similar to Acrobat Reader for PDF files), though without the benefits offered by having the proper Aspect Integrator Platform (ie, read-only, no connectivity, etc), or install the product into the local hard drive where it can be viewed by the AOV.

The Documentation Assistant and the AIP

A key element of the Industrial IT architecture is the Aspect Integrator Platform (AIP). Besides basic infrastructure services like open interfaces for integration with other systems, user identification and authorization, the AIP offers extensive functionality for solution life-cycle information management.

To help engineers generate the documentation, the Documentation Assistant uses many of the core features of the AIP:

2	Three-dimensional substation layout The operator selects the switchyard area he requires from this view.
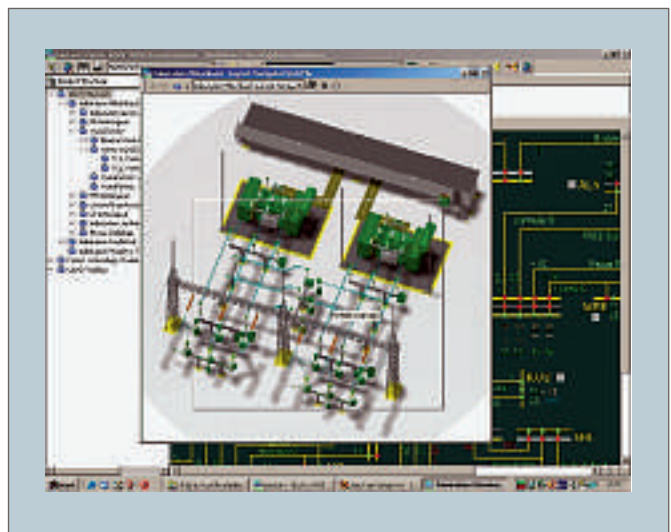
- Some standard documentation comes with all known substations. To avoid copying this documentation each time a substation is created, supertype – another feature of AIP – is used. The supertype Aspect Object is created once and can be re-used as required. Every new substation's Aspect Object is linked with its supertype Aspect Object and it can access all Aspects which were previously configured on the supertype Aspect Object.
- The Documentation Assistant exploits the multiple structure feature of AIP, described above, to construct data in a way relevant to the personnel using it.
- To help users find the Aspect Object they want, the Documentation Assistant also uses graphics displays, such as electrical circuit diagrams or the control and protection panel layout.
- To speed up document searching, the user can also use context menus, links to the predefined Aspect Objects and many other Windows© Explorer type features, like printing or file saving.
- After the substation Aspect Object is configured and ready for delivery, just a few clicks are all that is needed to save it on a CD along with all the required documentation. This package substation documentation can then be easily imported into the client's systems.
- Reuse of data is important, and here the Reuse Assistant – part of Industrial[IT] Engineering Studio – is essential. It has two modes. An expert uses the Architect Mode to prepare standard solutions for reuse purposes. This mode employs a question/answer routine to elicit information. The project engineer uses Build Mode to apply a standard solution in a particular project context. Build Mode provides a user-interface showing the guided tour with its pre-configured questions. They can be answered with a single choice of a pre-configured answer or by supplying technical data values. These then form a Reuse Instruction, containing operations in a determined order. The Documentation Assistant provides a set of Reuse Instructions to be used for compiling documentation for substations, thus saving time in defining the proper substation documentation set.

Industrial[IT] lets different users, like substation operators and maintenance engineers, structure the information display to suit their individual needs.

Retrieving the data

A folder tree structure or graphic interface provides easy information retrieval. For example, suppose a service operator needs to dispatch a technician to a remote substation. Mechanical drawings for the power transformer are needed to carry out the inspection. From his network system overview panel the operator selects the substation in question; this brings him to a 3D substation layout view **2**, from which he selects the primary switchyard area.

A single-line diagram showing more detail is now displayed. There he clicks on the power transformer symbol, to arrive at the bookshelf, from which he selects the Mechanical Drawings aspect. The required information is now available, ready to be printed **3**. It has taken just four mouse clicks to get there. There has been no aimless searching

| 3 | The required information, here a mechanical drawing of a power transformer |
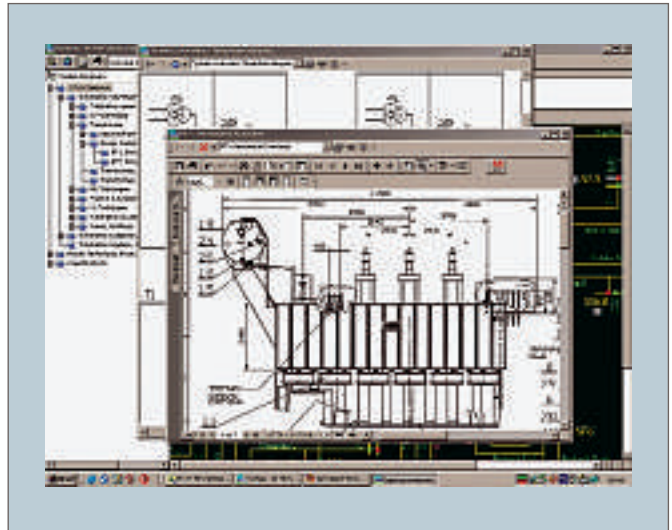
for, possibly non-existent binders or misplaced CDs.

The combination of ABB's Engineer[IT] Documentation Assistant and the AIP is a powerful tool for automatically generating and easily retrieving complete documentation for complex products like the substation considered here. Device information is presented in a variety of easy-to-navigate formats.

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