Core Technology

[Diagram showing eSupply, eCommerce, Systems Integration, ERP/MES, Application Services, eLogistics and Decision Support, Supplier, and Customer]

[Logo: Industrial IT enabled™]

[Logo: ABB]
Introduction
The Information Platform at the core of the IndustrialIT Solutions for Plant Management is based on InformIT Information Management Tenore, the IndustrialIT evolution of the field proven Tenore© technology. With a worldwide installed base of almost 700 licenses in more than 200 systems (Fig. 1), Tenore can bring to the customer the reliability of a solid platform and the experience gained in the most diverse applications.

Thanks to its flexibility, Tenore has been successfully adopted in basically any business segment, ranging from power plants to refineries, and in several application areas. The application extensions will enable this product to be used as an operator interface, a SCADA control station, or a Plant Information Management System (PIMS).

Tenore also offers the possibility to grow and expand with the customer’s needs. Its scalability will allow its introduction on a small plant and will follow the expansion into larger and larger applications, without any need to re-engineer configuration and applications, simply adding the options, nodes and functionality needed at any given time. The customer’s investment is thus preserved throughout the lifetime of the system.

IndustrialIT Enabling allows Tenore to operate smoothly with all the new products of the IndustrialIT Product Strategy, preserving the customer investments in technology and experience.

Features and Benefits at a Glance
Full-featured information platform
For enterprise management and control
- Client/Server architecture
- Multi-master redundancy
- Up to 130,000 tags
- Process monitoring and supervision
- Alarm management
- Analog and digital trending
- Data historian and archiving
- Real-time/historical trending
- SOE (Sequence of Events) support
- Parameter and event logging
- Excel Report generation
- Web Extensions support

Supported Industry Standards
- Windows® based platform
- Client/server architecture.
- ActiveX® controls
- Aspect Objects™ context-sensitive menu control
- E-mail integration
- DDE access
- OLE2/COM™ support
- TCP/IP, Ethernet protocols
- ODBC support
- OPC Server and OPC Client support
- HTML

High Performance Dynamic Color Graphics
- Standard symbols libraries
- Animation
- Scalable objects
- Graphic object import

Facilities
- System level diagnostic
- On-line documentation
- Multilevel security
- Scanner suite for ABB and foreign protocols interfacing
- User profile recognition
- International language support
- Quad monitor support
- WAV file alarm annunciation
- Intuitive point-and-click navigation
- Tool-tip support.

Fig. 1: Tenore installed base

<table>
<thead>
<tr>
<th>Industry</th>
<th>% of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Generation</td>
<td>63%</td>
</tr>
<tr>
<td>Process</td>
<td>20%</td>
</tr>
<tr>
<td>Metal, Mining and Paper</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
</tr>
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InformIT Information Management Tenore

Optimizing the value of data

**Architecture**

Tenore combines the most advanced technology in a true client-server, distributed architecture (Fig. 1, where the servers are responsible for the data collection and storing, alarm and events management, while the clients only present the information in a graphical format.

All the clients can, at the same time, access information in all the servers in the system. Graphical pages can therefore display the status of plant areas supported by different servers, potentially in separate locations.

The server layer of the architecture can expand over multiple levels in hierarchical structure, with lower-level servers collecting all the information and forwarding processed data to the higher-level ones. In this architecture, a store-and-forward function will prevent loss of data when problems occur at any level of the architecture.

**Redundancy**

Given Tenore’s inherent client/server architecture, redundancy for all client applications is built into the Tenore system. The principle behind Tenore redundancy is called multi-master. Simply stated, each server, at any level in the architecture, can be mirrored on as many redundant servers as deemed necessary (Fig. 3).

Clients are configured with a server access list, which includes all the servers where they can access data. At any given time, each client is connected to one server, and will fail over to the next server in the list as soon as the communication with the primary server is lost.

Each one of the servers in these clusters can collect data in parallel from the field or, if this is not supported by the field equipment, from another mirror server.

When Tenore is used as an operator stations, one of the servers in the cluster will be designated as the command master, and will be responsible for sending operator commands to the field and for mirroring such commands on all other servers.

Mirror servers also support cluster synchronization through replication of configuration changes and back filling of data and configuration at start-up time. This will ensure that all servers in a cluster are always synchronized.
Real Time Database
The Real Time Database is the core of the Information Platform, since it provides the basis for data integration and publication.

In addition to managing, in a uniform way, the current values of all configured tags, it also supports the automatic storage of short-term history. The default is 40 hours, extensible at will depending only on the hard disk available storage space. This is a function available for all tags, without requiring any additional configuration.

Each server can be configured with up to 130,000 tags, half of which is reserved for Boolean points, while the rest if for all other supported tag types.

Calculated tags (soft points), whose values are provided by associated algorithms rather than being acquired from the field, are handled exactly as all other tags, and enjoy all the same services and features (display, trending, alarming, etc.).

Hard disk usage is optimized by sophisticated data compression algorithms (boxcar/backslope), and the level of compression is controlled by the user through simple parameters configuration.

The Real Time Database also supports an ODBC mirroring function, allowing the replication of real time values to an external, ODBC compliant commercial database.

Data Acquisition
The primary function of the Information Platform is to collect data from miscellaneous sources which can include DCS (ABB or third party), PLC, RTU, Protections and applications. The Tenore component responsible for data acquisition is the I/O Scanner (Fig. 4). This module provides a common infrastructure for plug-in drivers, each one capable of communicating with a specific protocol. Up to 64 drivers can be used on each server.

Each driver processes data to provide diagnostic checks (limits, open circuit, loss of power, rate of change, etc.), numeric filtering (smoothing), alarm checking (with the capability of alarm inhibition and variable alarm limits), and bad quality management.

The following communication protocols are currently supported and available as standard options:
- Harmony/INFI (through semAPI)
- Harmony/DCI (through DAS)
- ControlIT AC800F (through OPC)
- ControlIT AC800M (through OPC)
- Freelance (through OPC)
- Standard OPC and ODBC Client
- Modbus
- SPABUS
- IEC 870-5-101/104
- Text
- Siemens Teleperm
- General Electric GSM (Mark V and VI)

New protocols are continuously being developed, so this list is constantly growing larger. Furthermore, specific protocols can be developed on request.
The dynamic process data is updated at a rate of once per second. The entire system is optimized to produce fast display retrieval and use minimal resources for data refreshing. Up to 10,000 displays can be configured for each client.

All text strings (menus, messages, help, etc.) are included in the multi-language support. Versions are currently available in English, Italian, German and French, and new languages can be easily supported, either directly by the customer or through ABB Services.

In addition to the native graphical engine, which supports multiple formats like GIF, JPG, BMP, graphical pages can be based on HTML and displayed with Internet Explorer.

Human-System Interface
The Tenore client, called Explorer, provides an interactive human-system interface through which operation or management personnel can easily and efficiently access plant data.

Multiple operator stations can be deployed in different locations in the plant, each equipped with QWERTY keyboard and mouse/trackball. Each one can access and combine on a single page data from multiple servers. Printers and plotters can be added to complement the CRT’s functionality.

Each client can display up to 16 windows concurrently, and a browser panel supporting hierarchical page structures facilitates navigation.

Tenore provides a complete full-graphic color information system based on Windows®. Displays may include real time data, such as process variables, digital inputs and outputs, as well as historical data and information from user generated files. The information may be presented using different formats such as alphanumeric, text string, bar charts, dynamic symbols and trends, all according to user requirements. Color, shape and blink can be associated to tag quality flags (e.g. acknowledged/unacknowledged alarms, etc.).
**Trends and X-Y Plots**

The trend display feature provides the ability to graphically display both current and historical data for up to 60 tags on each a single trend page. Any tag can be trended as real time data without being defined for historical storage. The trend presentation can be arranged in different formats and can be presented as a window inside other displays.

If needed, the Real Time presentation automatically accesses the historical archive in order to present older data. The operator can dynamically define tracks and display attributes. The fields that may be entered by the operator include process variable identification, scaling, start time, time span and color. All trend displays support pan and zoom functions, while a cursor will drive the display of point values on the trend curves. Statistical average, maximum and minimum are provided on demand for trended curves.

It is possible to display multiple tracks with different time basis, to support comparisons between similar tags over different periods of time.

X-Y plots are supported for intuitive and immediate correlation between two variables.

**Alarm Management**

Multiple alarm limits can be associated with any tag, regardless of the source (plant I/O, calculation, applications). Alarms can be acknowledged individually or by page.

Alarm conditions can be visualized both in a chronological summary format and dynamically on the process displays. Furthermore, a general overview of the plant conditions is continuously displayed on the icon toolbar by means of an alarm summary panel representing the status (normal or alarm condition) of plant sections or areas as defined in the configuration. A mouse click on one of the alarm tiles in the panel will immediately bring up the chronological alarm page for the corresponding area. A total of 256 areas (16 groups with 16 sub-groups each) are available for this purpose.

On a tag-by-tag basis it is possible to decide whether alarm and event are to be logged, displayed on operator stations, recorded in history files (archives), used to trigger custom applications, etc.

Each alarm can be associated with one of eight different priorities, corresponding to different colors on the display. Each variable is also associated to a particular plant area or equipment. The alarm summaries may be sorted chronologically or according to priority, area or any combination of the above.

Additionally, each alarm on the list can be associated to a graphical page, which will be displayed by double-clicking on that alarm.
Access Security
Plant information is one of the most valuable assets of the enterprise. The Tenore security system will ensure that it is only accessible to plant personnel with the proper authorization.

A security profile is associated to each user, characterized by user identification and password. Password aging policies can be activated, so that passwords will need to be changed periodically. Up to 16 user levels can be configured for each system. The security profile can only be changed by a log in of a different operator. The current context, defined by what pages are currently displayed, will not be changed by this operation.

The security profile will define what type of actions every user can perform on which areas of the plant. Actions include function keys, display viewing, tag configuration changes, alarm acknowledge, etc.

System Configuration
The configuration of a Tenore platform is a very simple process, and includes the following tasks:

- Configuration of the tag database
- Configuration of the Human Machine Interface

In addition to the tasks above, it may be necessary, depending on the specific use, to configure calculations, reports, historical trends and other application components. Each configuration process, however, is consistent in terms of look & feel, and a great effort has been made to ensure the user friendliness.

Tenore supports both online and offline configuration for tags and graphics:

- Offline configuration provides an efficient way of handling large volumes of data, and is suggested for the initial commissioning of a system
- Online configuration allows any change to individual tags and graphics while the system is running, and does not require any server or client restart

In a redundant configuration, all configuration changes are synchronized in a redundant server cluster.
Display Builder

The state-of-the-art Display Builder, provided as part of the standard Tenore license, facilitates the task of providing attractive and effective graphical pages for the presentation and management of plant information.

The construction of a graphical page is supported by a set of toolboxes for basic operations on shapes, and can take advantage of symbol libraries, which include pictures of the most common plant components.

For every object selected from a library and dropped on the working page, a dialog box is opened prompting the user to create the association of the object with a tag for animation purposes.

Tag Database Configuration

Every object in a Tenore system corresponds to a tag. Objects can be I/O points, controller-specific function blocks (for Harmony, AC800F and AC800M), calculated tags, but also system nodes and printers.

The off-line configuration process starts from one or more Excel spreadsheets, listing all the parameters and attributes of a tag. The spreadsheets constitute the input of the Database Builder, which creates the on-line version of the database.

Changes, addition and deletions can easily be performed on-line using the tab dialog box shown in Fig. 13. Changes are effective immediately after clicking on the Apply or OK button. The tabs are dependent on the tag type, so that all relevant information is presented to the user.

Configurable information include, for all tags:

- General information
- Processing information
- Alarm information
- Applications
- Network information

Additional, type-dependent tabs will be presented in

Fig. 12: Example of graphical page within the Display Builder

Tenore preserves the link between objects from a library and the pages where they have been used. This enables the automatic update of the pages where a symbol or object has been used, when this has been changed in the library.

In addition to basic shapes and library symbols and objects, pages can include static images in several standard formats like GIF and JPG.

It is also possible to integrate external ActiveX components in a graphical page, extending the capabilities of the Display Builder with an extensive choice of third party, commercial controls.

Fig. 13: Tag Configuration Dialog
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Diagnostic and System Management
In order to increase the system availability and reduce the total cost of ownership, Tenore provides a set of easy to use diagnostic and system management tools, giving a system administrator within the customer’s organization full and complete access to all the aspects of a Tenore system.

Access to the tools is based on a visual system explorer, with a look & feel compliant with the Windows 2000™ standards, as illustrated in Fig. 14.

Through these tools it is possible to:
- Monitor the client-server configuration
- View and update the environment registry
- Perform all the database management functions
- Import and export configuration data
- Manage the system backup and restore
- Monitor the network status

Related Documents
Additional information on specific system extensions and on the extensive portfolio of Tenore-based applications can be found in the following brochures:
- InformIT Information Management Tenore – Man Machine Interface Extensions
- InformIT Information Management Tenore – Plant Information Management Extensions
- InformIT Information Management Tenore – SCADA Extensions
- IndustrialIT for Plant Management and Optimization

Additionally, release notes and technical bulletins provide the latest news and additions to the product.

All the documentation is available through the ABB Library or on request, by contacting us through the e-mail address provided on the last page of each brochure.