

SCADA-A2 SCADA System Overview



Overview

SCADA-A2 is a SCADA system **MS Windows?** fully operated and compatible, **Internet-enabled**, designed for Utilities, Oil, Gas, Water, Wastewater, Electric power and multi-services Municipal applications.

SCADA-A2 represents cost-effective, high performance SCADA software suite. The suite creates and runs SCADA architectures that are Scalable-Open-and-Distributed, resulting in an easy to use and implement system. The software architecture is open and compatible with the WEB and INTERNET world. The SCADA-A2 Suite is based on and includes the high quality FactorySuite A2 Software products as a foundation of its design and composition.

SCADA-A2 has been developed merging the mutual very extensive field -proven experiences of **Wonderware®**, for the basic SCADA software environment (referenced in more than 100,000 installations world-wide), and **Foxboro**, for the application-oriented "automation solutions" (applied world-wide since 1962). Both Companies are part of **Invensys**, the global leader of process automation and control.



"ArchestrA^m" (A²) is an open, performance enabling platform that integrates Invensys and third parties applications from the field level, to automation systems, to business process work-flow into a unified architecture.

ArchestrA[™] is an "Automation Architecture", consisting of a suite of unified engineering tools, scaleable HMI and information clients, unified system administration tools, and a scaleable supervisory control engine. The scaleable historian interoperates with Invensys Automation offerings, including field instruments, control systems, HMI software, advanced applications and control software, safety systems.

SCADA-A2 is a solution belonging to the Invensys's SCADA Product line, tailored to globally fit the range of supervisory and remote control requirements in the Utility market and in each industrial application.

Benefits

Due to its truly-open distributed HW & SW architecture, the standard basic environment and the "knowledge-based" engineering solutions adopted, **SCADA-A2** guarantees to Customers measurable and real benefits, like:

- reduced operating and ownership costs over the lifecycle of the automation investment
- improved measurable performance increasing plant operating flexibility, efficiency and productivity
- HW/SW platforms and packages integrability, scalability and top-compatibility over the time
- cost-effective transition to automation upgrading with on-line replacement of legacy HW/SW subsystems.

Basic components

- Hardware : WINTEL PC
- Networking : Ethernet TCP/IP.
- Software : Microsoft Windows? 2000 Operating Systems.
 Wonderware? "Factory Suite A², packages Microsoft? SQL Server 2000 w ith standard ODBC interface. Invensys SCADA-A2 Add-on



SCADA System Description

Systems Architecture

Network

One of the major SCADA performance-indicator is represented from its capability to manage communications toward remote stations and subsystems, not only in term of reaction time but mainly (today more than in the past) on its capability to interface as many as possible Brands/models of RTU/PLCs/IEDs and communication Protocols.

For this reason particular attention has been paid in providing **SCADA-A2** with a really huge communication and networking capability, that includes:

- I/A Series R20 and R50 RTUs families and SCD5200 Remote Station Computer
- Wide range of Communication Protocols RTUs (Modbus & Modbus+, Profibus, DNP3.0) and PLCs (Allen-Bradley, Bristol Babcock, Ge Fanuc, Nuovo Pignone P6008, Siemens, Mitsubishi, Modicon, OMRON, Fisher, Reliance, Square D, etc).
- Dual LAN Ethernet support.
- Internet/Intranet Real-time interface for remote access to the system from WEB.
- GPS software for Satellite Time-synchronisation toward SCADA Computers, RTUs and PLCs.
- Data exchange between Sub-Master systems and Central Control site on Wide Area Network, using also Satellite communications.
- SCADA Master station run-time-database synchronisation with "report-by-exception" technique and background polls of all Sub-Master tag values to Central Control Site.
- Front End Processing accomplished by routers, bridges, terminal and I/O servers, etc.
- Real-time communication-status monitoring up to field devices.

All the available SCADA industry communication media (switched or dedicated telephone lines, radio, microwaves, optic fibres, power line carriers, satellite, mixed systems) are commonly handled in single and redundant configuration.

Fields of Application

SCADA-A2 plant-oriented functionality has been developed on Foxboro's field proven very deep processknowledge.

Oil & Gas

- Onshore & Offshore production fields
- Deep-water production platforms, sea-lines and sea-terminals
- Production/reinjection Well-heads
- Gathering, Treatment and Storage plants, tank farms
- Reinjection facilities
- Pipelines (including multiproduct)
- Pumping and Compressor stations
- Metering stations and City gates
- Loading/unloading, transportation and product-movement facilities
- Distribution networks
- Gas turbines and compressor advanced local/remote diagnostics.

Utilities and Municipal companies

Gas, Water, Power; Heating distribution networks



- Water resources, wells and reservoirs
- Water and Wastewater treatment facilities
- Aqueducts and pumping stations
- Irrigation networks
- Customers' management, Billing and Nomination, Contracts management
- Enterprise business global management.

Electricity

- Multi-fuel Power generation plants
- Power distribution networks
- Substations
- Cogeneration facilities.



The Win-Win Solution

SCADA -A2 represent today a powerful tool to run plants at their highest level of economic performances, providing, in the meantime, the lowest cost of ownership during plant lifecycle by protecting Customer's investment SCADA -A2 added value is represented by:

- A cost effective SCADA solution designed-on-process for to the major industrial applications, integrating the best technologies and fitting the most advanced market demands. Fully owned, developed and supported by a global leading automation supplier.
- Popular state-of-the-art technology with "application oriented" field-proven advanced functionality to easily fit each Customer automation requirements for all plant lifecycle.
- A last-generation SCADA system capable to increase Corporate global performance and plants efficiency, while reducing management costs, through the Invensys EXPERIENCED MIX of process knowledge, standard environments and proven use of in-house-developed enhanced automation tools.





The answer to Geographic and Functional distribution

Maintenance

SCADA-A2 Engineering Suite

The SCADA-A2 Engineering Suite is the Engineering tool used to define the main data that will be used by the SCADA-A2 Runtime Server and by the SCADA-A2 Operation Pack.

This tool delivers a centralized point for SCADA-A2 development and deployment. The main configuration data and/or the links to them are stored in a centralized relational database with the purpose to deliver an integrated development environment.

By using the SCADA-A2 Engineering Suite can be configured the SCADA-A2 Point Database, managing also the complex data structure required by the SCADA System.

- 1. Access name
- 2. Alarm Groups
- 3. Field Analog Points or Field Digital Points
- 4. Digital Commands or Analog Commands
- 5. Field Messages



For database variable linked to devices:

- 1. Legal Status
- 2. Types Device
- 3. Device

For Analog formula:

- 1. Constants
- 2. Analog formula
- 3. Calculated analog Points

For Digital formula:

- 1. Digital formula
- 2. Calculated Digital Points

The same Centralized Configuration environment manages:

Main HMI configuration :

- SCADA system display (by using the standard Wonderware Factory Suite A2 Graphic Editor
- Display Organization:
 - Pages browsing Tree Description : to configure the browsing structure of the type Next-Previous, Up-Down between the system plant pages.
 - Pages browsing Level Description : to define some main customisation of the main SCADA-A2 navigation toolbar :

Page Name	It is the name of HMI Display.
Button text	It is the description on the button calling the selected HMI Display.
Level	Level of logical or physical partition of the plant.
Alarm Group Name	It is the cumulative alarm Group associated to this Display. It is used to display colorful flashing area that highlight the presence of at list one alarm for the Alarm Group.
Order Nbr.	It is the presentation sorting for the pages belonging to a same level.
Up page	Upper page for selected page.

SCADA Architecture : SCADA-A2 can be used to satisfy the requirement of different SCADA Architecture. The User can use the SCADA-A2 engineering Suite to give instruction to the SCADA-A2 Package regarding the architecture.

SCADA Report Configuration

SCADA Security Subsystem (includes the definition of the Area of Responsability)

SCADA Configuration Database utility :

- Import/Export Database from/to Excel files
- Automatic filling of Tagserver Backup Database
- Automatic Configuration Files Deployment to HMI Client, Tagservers, Historical Database Servers with tracking of the date of last Data Deployment.



- Automatic Database configuration of Wonderware InSQL Package to import the SCADA-A2 Point that has to be stored into the historical database.
- Report to print in a suitable format the data prepared for the SCADA-A2 and to print the I/O Summary.

Operations Environment

SCADA-A2 HMI is driven by the world's most referenced and field-proven 32-bit, OBJECT-oriented, HMI package for industrial applications: **Wonderware Factory Suite InTouch™**. Typical SCADA HMI functions include:

- Real-time Data presentation and animation in graphic and alphanumeric formats
- Horizontal and vertical analog bar chart management
- Third Party "Active-X" import/export, integration and archiving

SCADA -A2 Operation Pack adds to the core Software :

- Detailed SCADA-A2 Point description displays
- Bidimensional navigation through mouse
- Plant-sections grouping, presentation and summaries
- Configurable trends, reports, alarms/events lists
- User-friendly system configurator to maintain, modify and implement the SCADA database (graphics and TAGs).
- Commands and Set-points with security confirmation
- Multi-level passwords management
- Multi-monitor HMI (Configuration & Run Time)

SCADA-A2 Advanced Security

The Security Subsystem can be divided in two parts:

- Configuration: this function is included into the Configuration Environment. All the Configuration action are under control of the SCADA-A2 Engineering Suite.
- Run time

Users definition

Each user of SCADA system will be characterized by:

- User's Name: max. Size 12 characters
- Password: max. Size 8 characters

The user can change his own password, run time, from the HMI.

Each User Name, besides the Password, has associated the following characteristics:

- User's Profile (group of functionalities)
- Area of Responsibility: a maximum of 10 Areas of Responsibility are allowed.

It is possible to create, delete and modify users and their characteristics using the Configuration Tools The information will be stored in a standard Microsoft Access Database.



User Management

User management is a function available during the Run Time of the SCADA System (directly from SCADA HMI).

Main Subsystem functions:

- Authentication of User that requests connection
- Query to have information on the connected users (who has logged on)
- Log on time: when users have been connected
- Log off time: when users have been disconnected
- Management of conflict among users with the same permissions: the first already connected user has the possibility to act, the others, on the contrary, can only visualize the system. As soon as the first logs off, the second that has connected can act, and so on.
- Automatic log off management after a period of inactivity: warning and Time Out messages.
- Change of password for each user.
- Any time the user logs on the system checks which actions are allowed. Buttons on the SCADA graphic form are activated or deactivated, depending on the user's profile and on the entrusted responsibility.
- Log on and Log off events can be can be detected and registered as events or alarms on alarms page and registered on historical DB.

The previous functions are developed using both the standard Wonderware Factory Suite A2 functions and add-on developed by Invensys Foxboro (Dynamic Link Library and dedicate programs).

DEFINITION OF USER PROFILES

Each user's profile is characterized by the whole of following functionalities:

- Users Configuration, Users' Profiles and Area of Responsibility.
- Alarms acknowledgement.
- Command execution (physical, logical, "put on-scan, off-scan", alarm inhibition)
- Creation of Trend and Report
- Change of alarm limit
- Visualization of current and historical status (summaries, historical trends, reports, alarms, ANALOG and digital input/output signals)
- Application Shutdown
- Operating System Shutdown.

A dedicated add-on function will manage the check of the permissions associated to the user (by using its User Name).

The Security engine stores the output of this check in the SCADA-A2 real time database.

When the control gives a positive result, the security system will give the permission to execute at HMI level the requested functions.



HMI Displays

HMI for SCADA-A2 Point Details

Analog Detail	
TAG Name AI 081012 EU Value 800.00 Eng Unit % Scale Start 0.00 Scale End 1000.00 Comment MOISTURE SAMPLING BOX ANALYSIS INDI i TION	Tag relevant characteristics including its value
4-20 mA 4000 RAW Value 300 Quality Bad O UnRel O Good O SubStatus Non-specific	Quality of the point included its address.
QualityLimit Not Limited Item Name GMOOAR:rAI_08101Z	
Alarms Alarms High High High 990.00 High 980.00 Ack Alarms state Low 20.00 "Bad" stat	Status and alarm range of the Tag.
Out of scan	Shown if the Tag is current included in the set of Tags whose value is updated with data collected from field
Put out of scan Put in scan	

In order to have an easy and consistent data presentation in all SCADA-A2 System, some standard windows are included in the package. (see as an example the window for the SCADA-A2 Analog Point) One Detailed page for every relevant SCADA-A2 Data Type is included. The real time data data shown in the window are read directly from the Main TagServer. This window, as all the SCADA-A2 HMI functions, has embedded support for Redundant TagServer Configuration.

By using this window the SCADA Operator can deactivate (put out of scanning – in maintenance) a particular unit, then can force its value if necessary, or simply can analyze its contributors in real time. Besides the direct access by selecting the object from the graphical page, it is possible to use the integrated Combo-Box (in full Windows style) to make a search and to select another one at screen without needing to locate it before in the display.

These windows show all relevant SCADA Point data and allow modification.

In all the windows there is a button (labeled with $\langle i \rangle$) that activate the retrieval of comments and notes already associated with that Tagname.

By using the same windows, other data are available :



- Terminals dedicated to the variable,
- Information on the field instrument, etc.

HMI for Commands

EXAMPLE: HOW TO SEND A COMMAND TO A DEVICE





EXAMPLE: HOW TO SEND A COMMAND TO AN ANALOG TAG

From the Analog detail window it is possible to force the state of a point, put it in and out of scansion.

Analog Detail	
TAG Name Image: Constraint of the second secon	Tag relevant characteristics including its value
Comment MOISTURE SAMPLING BOX ANALYSIS INDI i TION 4-20 mA 4000 RAW Value 800 Quality	
Bad O UnRel O Good O SubStatus Non-specific QualityLimit Not Limited Item Name GMOOAR.rAI_08101Z	Quality of the point included its address.
Alarms High High 990.00 Bad" stat High 980.00 Alarms state Low 20.00 Bad" alarms activated	Status and alarm range of the Tag.
Out of scan	Shown if the Tag is current included in the set of Tags whose value is updated with data collected from field
Put out of scan Put in scan	
VSetValue TI_03101 Old value 275.00 X Cancel New value 275.00 Continu	

Send Command to Digital Tag

From the Digital detail window it is possible to force the status of a point, put it in or out of scansion.

Select the digital TAG on which execute the action.

Click on "Put out of scan"... (Note that the address becomes BLUE)



XPALL_03101	
Old value On	Cancel
New value On	Confirm

Click on the number next to "Value", set up and confirm the forcing.

HMI for Summary Windows [Standard SCADA-A2 Toolbar]

The summary page is built to show, apart from the SCADA-A2 Point, descriptions, installation and variable state, the present value and the engineering unit for ANALOG variables and the position of digital variables.

ANALOG

ANALOG

Analog Tagname Summary

By clicking on "SUMMARIES" function a window is opened for the selection of the typology of the summary to be displayed.



The first picture shows the window that will open on selecting ANALOG SUMMARY. Select a logical grouping and accordingly the blue arrow next to all the relative ANALOG data is inserted into the summary. The selection of single ANALOG data is done in *selection by name*. Select an ANALOG from the summary and the red arrow next to it will be removed from the summary. Selecting the multiple arrows allows one to insert (blue) and remove (red) all the variables.



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The picture on the side shows the summary displayed after having clicked on the CONFIRM



Digital Tagname Summary



Device Tagname Summary



The first picture shows the window that will open on selecting DEVICES SUMMARY. Select a logical grouping and accordingly the blue arrow next to all the relative devices is inserted into the summary. The selection of single devices is done in *selection by name*. Select a device from the summary and the red arrow next to it will be removed from the summary. Selecting the multiple arrows allows one to insert (blue) and remove (red) all the variables.

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HMI for SCADA Operator Utilities

Out of scan

This function allows the operator to obtain a list of all the points that were put in OUT OF SCAN through the point detail pages. This summary allows the qualified operator, with a simple point & click action with the mouse, to select a SCADA-A2 Point that is out of scan and automatically access to the associated Point Detail. From this window the SCADA Operator can execute all the necessary action to put in SCAN the SCADA-A2 Point.



System functionality block

The selection of the virtual key SYSTEM disables the possibility to activate all the Microsoft Windows standard functions available with the activation of the button :

Application shut-down

The SCADA Operator has a dedicated window to execute main action on the SCADA system itself:

- Shutdown SCADA System
- Shutdown System
- Restart System
- Close all active program to make a new access with a different System Logon.

The function is available only for an operator with Administrator access rigths.



All this functions are available only to the users with the Correct Access Level.

Hard copy

If a printer is connected to the system by selecting this function, a confirmation request to proceed with printing will appear in the synoptic zone of the monitor. Once the printing has stopped this function will confirm the completion of the task.



HMI for Historical Data

How to access

From the standard SCADA-A2 Navigation Toolbar :



Product Overview

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<u>Trend</u>

The following picture contains the graphic display of the tag values relating to the last 4 hours. The functions that appear on opening this window give to the operator the access to the data archives on the SQL Server.





Data types displayed	Analog, Discrete, Events, Strings
Stacking and scaling features	Auto scale (InSQL original scaling or normalized scaling)
	Auto stack (vertically separates, stacks and scales all trends) Custom stack (remembers custom scaling and stacking settings)
Annotations (comments)	Appear directly on the trend
	Appear in tabular format
	Selectable as public or private information
	May be edited and shared
Delta retrieval mode	Supports analog or discrete data types
	Extremely accurate display of data Highly useful for Real-Time, Historical and Event trending
Improved workspace management	Displays multiple trend files
	Simplified configuration
	Retentive attributes and sizing
Multiple cursor pairs	2 X-axis (time) cursors
	2 Y-axis (value) cursors
	Cursor pairs display delta values Cursors may cross one another at any time



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Administrator 25/10/02 1	11:23:29 UNACK 11:23:29 UNACK	05C 152 05C 152	021_4585\fa 021_4571\fa	DEMESTIC DEMESTIC	CO GAS FLOM	#1 WALVE	Unrel. VALUE Unrel.	a Urrelaa	17.44.28 25/10/200
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This function allows one to open up the trend page as is shown in the figure. The available Tags can be selected on the Property panel and then the display parameters one needs to apply can be selected. The operator cannot carry out operations of display options and saving.

HMI for ALARM Management & Visualization

In the Standard SCADA-A2 Navigation Toolbar is already defined a button to access to the Alarm Display dedicated window.





This Alarms Page contains all the alarms currently active in the SCADA system.

The Standard Alarm Display

The standard alarm system provides you with a unique display object that you use to show locally generated alarms. While the distributed alarm system provides you with a display object that can show alarms generated both locally and remotely.

The standard alarm display uses two predefined display types:

"Alarm Summary ": The Alarm Summary only displays the current unacknowledged and acknowledged alarms. No events are displayed with an Alarm Summary.

"Alarm History ": The Alarm History object displays all of the alarm and events that have occurred. The Alarm History display shows the occurrence of the alarm, the time of acknowledgment (if any) and the time the alarm condition returned to normal.

In both the Alarm Summary and the Alarm History display objects, each entry is shown as a separate line. The number of entries displayed is determined by the size of the alarm object drawn and the size of the selected font. The standard alarm display lists all active alarms or subsets of active alarms as determined by the current value of the Alarm Group and priority expression associated with the particular alarm display.

Alarm list scrolling is provided both in vertical and horizontal.

The horizontal scrolling is needed when the displayed message is longer than the window width.

A scroll bar is provided for this purpose.

The vertical scrolling is needed when the number of messages in the list is higher than the number of displayed items in the window.

Another scroll bar is provided for this purpose. Additional scrolling features are:

Additional scrolling features are:

- Vertical page scrolling (page-up/page-down)
- Top of the list
- Bottom of the list

The image below shows the alarms page:



Alarms Presentation on the HMI displays



Alarms

Within this specification, an *alarm* is an abnormal *condition* and is thus a special case of a *condition*. Furthermore, a condition may be defined (optionally) to include multiple *sub-conditions*. For example, a LevelAlarm condition may include the "HighAlarm", "HighHighAlarm", "LowAlarm", and "LowLowAlarm" sub-conditions.

Also, an *event* is a detectable occurrence, which is of significance to the Supervisory Activity. An event may or may not be associated with a condition. For example, the transitions into the Alarm Condition and the return to normal are events, which are associated with conditions. However, operator actions, system configuration changes, and system errors are examples of events, which are not related to specific conditions.

Since an alarm condition is usually based on one or more data from fields, which have a Quality attribute, the alarm condition also has an associated quality. If the process value is "Uncertain", the alarm condition is also questionable. When the quality changes, it will generate an event notification.

The definition of an alarm condition might happen automatically by the system according to the physical element present in the HW and SW architecture, or as in SCADA-A2, by the user during the configuration phase when are defined all the possible statuses of a device.

SCADA-A2 supports the concept of "Alarm Provider" and "Alarm Requestor". An "Alarm Provider" performs alarm processing and makes alarm status data available to any "Alarm Requestor" to populate alarm display objects. Alarm Acknowledgment at an "Alarm Requestor" is transmitted to the "Alarm Provider" and thence to all other Alarm Requestor so that operators have a consistent view of alarm conditions.

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🔽 Alarm Provider	Length: 15
🖙 Value at Alarm	Length: 5
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Alarm Configuration

A information fields associated to the SCADA-A2 alarm message are selected in phase of configuration (Window Maker) of the alarms subsystem so that they are inserted in the alarm message or not.

The width of each information field can be defined both in phase of configuration and in run-time.

In phase of configuration the type font to be used and the colour of the message of return to normal condition from the alarm condition are also definable, in this case the green colour is generally used.

The picture shows the information configured and inserted in the alarm message.

Alarm inhibit

Alarm inhibit function can be configured or activated run-time. This function does not affect the relevant data processing; only the alarm processing is affected.

It is also possible to consent to a whole alarms group not to emit any notification after certain digital conditions. It is possible by using the application designed to the Boolean calculations. It is sufficient to



configure a Boolean calculation, which controls the status of digital values and emits the calculation result (*True* or *False*) on the alarm Enabling **dot field** of the Alarm Group to be inhibited.

Alarm Acknowledge

The arrival of new alarms is signaled by a sounds, to alert the operator and a part of the screen, that is always present on the screen, will change colour or will blink informing the operator that something in that plant section happened.

Alarms can be audible and visual acknowledged, and deleted.

• Alarm acknowledging can be performed only through the SUMMARY page, applied to alarm conditions or to relevant off conditions.

Alarm acknowledging can be:

General: all alarm conditions currently in progress, independently from displayed items.
For page: only alarms displayed on the current page.
For selected message: only selected item on the page.
For latest message: the last item, not acknowledged, notified by the system.

Generally an alarm acknowledging determines a message colour changing (i.e. light red).

Change alarm limits

The values of alarm limits can be changed. A pop up windows, presented on user request (according to the access rights associated to the user), has all the input mechanism to setup the new values.

The action of alarm limit change is recorded in an event message.

Printing

Besides the screen notification to the operator a printing recording of the detected alarms is necessary to keep trace of what happened.

The methodology for the alarm printing is a chronological display in which a new message is printed on a line that has the same information present on the message line displayed on the alarm page.

Limit control

For each measure the following limits can be defined:

- High or high high safety limits
- High conduction limit or high limit
- Low conduction limit or low limit
- Low safety limits or low low limit
- Incremental or deviated limits (Rate of change)

Incremental limit control

The incremental limit allows the control of variations along time of analog measures.

If the value of the analog measure along time overflows the incremental limit value, an alarm message warns the operator.

The incremental limit value is set out during the configuration phase.

Dead band

In order to avoid oscillations around the limit, there is insensitivity band with a configurable frequency and differentiated between high and low limits.



<u>Alarm Types</u>

Alarms are classified into several general categories based on their characteristics. These categories are known as Type and Class. The standard alarm system categorizes all alarms into five general Types: Discrete, Deviation, Rate -of-Change, Value, and SPC.

Alarm Priorities

Each alarm has a priority value associated with it. This value represents the severity of the alarm and has a numeric select form a predefined interval. Using this information it is possible to easily filter out critical alarms from non-critical ones. This information can be used to create animation links, acknowledgment scripts, and filtered viewing and printing all based on the priority range.

It is possible to define the number of interval and the associated range of value .:

When a plant engineers create a plant tagnames and the associated alarm conditions, each alarm will be assigned to one of these severity levels by choosing a priority number within that range. With these ranges configured, the plant operators may now easily display and print only certain severity levels.

Alarm Group Hierarchy

Each alarm is assigned to a logical Alarm Group. These groups are user-definable and can be arranged into a hierarchy up to eight levels. All defined Alarm Groups automatically become descendants of the default group. Each Alarm Group may have a maximum of 16 subgroups. Each subgroup may have a maximum of 16 subgroups, etc., until the maximum of 8 levels is reached.

The groups provide a way of categorizing alarms based on an organization, plant layout, or any other metric you choose. Alarm Groups are useful for filtering alarm displays, alarm printers, and acknowledgment scripts.

Every tagname is associated with an Alarm Group.

This tree may have up to eight levels.

This tree concept is similar to the Windows directory structure, where a directory may contain other subdirectories (analogous to groups) and file names (analogous to tagnames). Using the Alarm Group concept it is possible:

- A division of the system variables in logical groups regardless of the belonging to field equipments.
- A calculation in the group of the current alarm conditions on the associated variables.
- The recognition and/or the selection of the single group by the operator.
- Higher speed for operator in locating the single alarm condition.

Notification of operator actions on historical alarms files

All the actions that an operator executes on a variable (change of limits, activation/deactivation, in maintenance, etc.) can be notified as historical alarms (be inserted in the *.alg* files containing the historical alarms). To activate the function it is sufficient that the *log event* attribute of the variable involved in the variation is put to *On*. This operation is performed in phase of configuration of the variable.

Diagnostic alarms pages

The alarms defined *Diagnostic* are all the alarms not referred to parts of the system to be controlled; therefore they are generally:

Alarms of RTU parts or concentrators,



Alarms of system components like Client, Server, Services, and other system equipment.

All these alarms are part of the \$System alarms group and consequently they are not singularly displayable.

SCADA-A2 System Engineering Suite

Data Acquisition

SCADA -A2 Supervisor y and Remote control functions include:

- Data acquisition, validation, processing, synchronisation
- Distributed alarms, events and Historical system
- Multi-level Alarm filtering (up to 999 levels available)
- Analog/digital Commands subsystem
- Process control automatic remote sequences programmable through IEC-1131-3 standards
- Easy configurable HMI including graphic displays, summaries, trends, reports, logs, printouts
- Complete system's real-time diagnostics (HW, SW, communications) and recovery actions on fault
- Process, materials, predictive and production analysis
- Smart maintenance scheduling on plant devices
- Real time alert for Maintenance crews through standard telephone connections (automatic phone-call to plant's maintenance people with smart interactive voice messages).

Protocols

- DNP
- Modbus

Data Types

- Real time data
- Event Data
- Metered Data

Device Types

- RTUs
- PLCs
- EFM Devices
- Other Devices

SCANNING

- IO Servers
- OPC Servers
- DA Servers
- OPC Clients



Open Interfaces

SQL ODBC OPC

SCADA-A2 Historical Archive

The SCADA-A2 Historical Archive is based on Industrial SQL Server from Invensys the world's most popular production data historian. It provides the industry's highest performance with the lowest cost of ownership.

By using this package the SCADA System can Captures and stores all plant data. The data are then available for following retrieve. The capture and storage algorithms help to reduce the necessary amount of storage space.

Because the data are stored in a Relational database, the data can be retrieved by using standard SQL Database.

From the SCADA-A2 Engineering Suite it is possible to set into the SCADA Point the attribute that activate the archiving functions. Then, on User request, is activated a procedure that execute in the InSQL Database the necessary actions to configure it according to the output of configuration activity.

By using the standard functions available in Microsoft Office (OLEDB, ODBC,) it is possible to access data stored into the SCADA Historical Database.

With SCADA-A2 are delivered some predefined report that collects data from SCADA Historical Database and format (by using MS Excel) some base report making it available in the redundant SCADA Architecture. The SCADA-A2 HMI is already configured to open to the SCADA Operator the access to the configured Historical Report.

Data archiving and calculation subsystems are usually configured with the following features:

Archive subsystem equipped with:

- Open Flexible Access
- Dynamic data compression techniques
- Distributed History
- High Performance Server able to store Run-time data (using store-by-exception technique) in a relational database accessible through SQL language with user account and security management.
- Interfacing any table in any ODBC compliant database source.
- Redundant system architecture (if requested).
- Report Subsystem to print Historical and Run-time data at a defined date.
- Pre-defined Excel? Worksheet to print daily, monthly, yearly reports.
- Trend Subsystem with pre-configured trend curves.



Report



To simplify the selection of the time interval used to retrieve data, it is available a sub window showing a Calendar in Windows look &feel.

By clicking on the EXEC button an EXCEL page is automatically opened.

The windows will contain all the data configured by using the Configuration Package.

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The EXCEL pages perform the usual Microsoft functions: save, save as, print, etc.