Basic elements of a SCADA**vantage™** system

SCADA**vantage™** has three distinct parts: the DVI, the RTRDB, and the Client. Diagram 1 on the following page shows how the three parts function and how they interact with each other.
SCADAvantage™ Network Topology
System software products

DVI
The Data Acquisition Interface module (DVI) resides on the server providing the I/O path (e.g., a serial port to the radio) and provides polling of the devices. The DVI can function according to a schedule or in response to a demand or fast scan poll request. The DVI acts like a traffic cop to reduce interference, thus allowing devices with different protocols to share a common I/O port or radio system. The DVI also incorporates the standard Totalflow port manager, the CPC, so that it can also support other Totalflow packages when desired.

RTRDB
The Real-Time Relational DataBase provides the storage for the system configuration, I/O information, polled or real-time data, alarms, alarm limits, schedules, and other supporting information about the system and its objects. The RTRDB has a built-in historian which saves data on a scheduled basis (per tag) and which can be used for both trending and reporting. The SCADAvantage™ RTRDB is both a DDE and an OPC Server and Client so data can be read from an OPC or DDE source (e.g., an OPC driver) or sent to an OPC or DDE Client.

Design
The SCADAvantage™ design utilizes open standards and Microsoft standards throughout, collecting data into a real time database that can be accessed as an OLE-DB or ODBC database using standard SQL Statements. This allows authorized corporate applications to easily access this data.

The Client
The Client is a Rich Client. This means that the drawings and other formatting information is stored on the client, and that the system only needs to send data to the client for the display. For clients on a low bandwidth channel, the displays will still be responsive. Maintenance at the client is minimized because the Client Application Manager (CAM) will automatically update the users when a display is changed.

Basic elements of a SCADAvantage™ system

Diagram 1
Links

Links between the DVI and the RTRDB and between the RTRDB and the Client are TCP/IP. This is the standard protocol for Windows based Corporate Networks. Thus, the system can be configured with everything (DVI, RTRDB, Client) on one computer, or they can be separated on different machines.

In addition, because the links are TCP/IP, the protocol of the Internet, the DVI, RTRDB, and Client can communicate over the Internet as easily as within the corporate network – once appropriate firewall issues are dealt with. Normally, this is used to provide remote client access from a user’s home or hotel room. Often, this is done with a VPN.

Modularity

Because of its modularity, SCADAvantage™ scales easily from a base configuration on a single server at a regional office to a corporate enterprise system with multiple locations supporting numerous variations of remote devices with extensive data management and reporting capabilities.

License

The SCADAvantage™ License is quoted functionally on the tag count. The client software (HMI) is provided with the initial cost of the system. The HMI can be installed on any number of PCs or Laptops for no additional charge. This allows an organization to provide displays for all those who need the information; i.e., there is not a per seat charge. Different permissions to various functions and devices can be provided to each user along with a Login ID and password. The permissions determine what rights each user has relative to viewing, changing, or polling various remote devices. This provides convenient and strong security – allowing authorized people to do extensive work on the system, and restricting those who only need to view data to that capability.

Handling custody transfer data in a SCADAvantage™ system

In general, there are two types of data that the Flow Computers provide – Operational data and Custody Transfer or Audit trail data. The operational data is normally used in a SCADA system to provide data for the day-to-day operation of the compressors, field, tanks, pipeline, or facility. This includes such data as Current Temperature, Pressures, flow rates, alarm status, tank levels and similar information. This data is kept in a real-time database and provides the basis for operator displays, trends, operational reports, alarms, call-outs and other operational needs.

Audit trail data is generally kept as a history file in the Flow Computer, usually hourly data with daily rollups for up to 35 days. In addition, there is a characteristic (setup) file and an events file. The audit trail begins in the device, and is continued during collection and subsequent data handling. Audit trail data is read so that it comes into the computer all at once so that the user has a snapshot of the device and its data all at one instant. For a solid audit trail, the data is provided in a binary format with appropriate security codes to insure that it is not changed. The audit trail is maintained even through editing, reporting, and export to the user’s billing system.

ABB Totalflow has a product for handling Audit trail data, the WinCCU software. In a SCADAvantage™ System, WinCCU shares the I/O port and collects the Audit trail data over the same data link. Diagram 2 shows how this works:

Data from the WinCCU is stored in the SQL Server database, while data from the SCADAvantage™ system is stored in the RTRDB.

There is some overlap in the data. SCADAvantage™ has access to the WinCCU data for displays, reports, etc. Normally, though, the SCADA system focuses on the operational data and the trend data stored in its Historian.
Common SCADAvantage™ applications

SCADAvantage™ commonly supports:
- Well-Site data management and display
  - Plunger lift
  - Pump control
  - Valve control
  - Other Well site automation
- Gathering Systems
- Compressor management and alarming
- Pipeline Management

SCADAvantage™ can provide simple displays and reports, or it can provide extensive computational capabilities, data distribution within a local office or throughout the organization, sophisticated call-out / call-in capabilities, built-in trends, and other advanced SCADA functionality.

The following diagrams show possible network topologies for a SCADAvantage™ system with WinCCU:

The diagram 3 depicts two optional configurations that SCADAvantage™ can provide. The modular approach gives customers optional methods to solve most problems that may arise. An example can require servers to reside at different locations. A server can be at the site of the devices and serviced by the DVI (Device Interface, used to converse with each device in the field). The RTRDB (Real Time Relational Database, which is held in memory) can be installed on a separate server for performance sake. The RTRDB and DVI converse with each other via TCP/IP connections and therefore can be anywhere on the Network. The HMI Client is a user interface which can be on the server but is normally located on any number of laptops or Workstations anywhere on the Network. WinCCU can also be installed on one or more laptops or Workstations. WinCCU requires either an Access database or SQL Server (preferred). The SCADAvantage™ server can be located at the site or at the corporate office. The DVI can communicate via the Network to the devices.
Redundant configurations

SCADAvantage™ provides a redundancy capability which features automatic failover.

Two ways (of many) to build a System Topology

SCADAvantage™, WinCCU, HMI Client (All could be on one PC)

SCADAvantage™, WinCCU, HMI Client on several networked PCs
The diagram 4 depicts an example of two servers in a redundant configuration (Server #1 & #2). Another server is provided to house the SQL Server database for the WinCCU Audit Trail and long term database.

The SQL Server may be located locally or at the corporate data center.

SCADAvantage redundant servers #1 & #2
HMI Client is on a remote PC and works with Server #1 or #2
SQL Server is installed on Server #3
WinCCU is on any remote PC and works with Server #3
Server #3 holds WinCCU LTDB database and Archive File
Diagram 5 depicts a SCADA™ Network showing interface to the Internet.

**System diagram**

**Clients**
Display operational data from SCADA™ Database using SCADA™ client.
Display audit trail data from WinCCU Database using WinCCU.

The SCADA™ Server reads data from the Remote Flow Computers, RTUs, and/or PLCs.

SCADA™ reads operational data
WinCCU reads audit trail data

**Remote clients**
Display operational data from SCADA™ Database using SCADA™ client.
Display audit trail data from WinCCU Database using WinCCU.

Diagram 5
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