SCADA introduction

- What is SCADA?
- What's the history of SCADA?
- Exemplary SCADA systems
- Systems SCADA practical applications an introduction to the reminder of the lecture

SCADA (Supervisory Control And Data Acquisition) is a type of industrial control system (ICS). Industrial control systems are computer-controlled systems that monitor and control industrial processes that exist in the physical world. SCADA systems historically distinguish themselves from other ICS systems by being large-scale processes that can include multiple sites, and large distances.



SCADA vs. ICS vs. PLC

	Industry	Discipline
PLC/ES	Automotive	Process control
ICS	Refinery	Discrete control
SCADA	Pipeline	Wide area control

Traditionally "SCADA" is used for control systems that cover a wide geographic area.



Introduction – What is SCADA?

SCADA vs. ICS/DCS vs. PLC



vs. Term **spaghetti**:

- Industrial Control System (ICS) a contender
- Industrial Automation (IA) another contender

 Manufacturing and Control Systems (M&CS) - used by the ISA-99 (Industrial Automation and Control Systems Security committee) committees until 2006

 Industrial Automation and Control Systems (IACS) – now used by the ISA-99 committee

• Control Systems – too general as it would encompass things like building automation and even home appliances

• SCADA - as an all-encompassing term, SCADA fails because all old-timers think of SCADA as wide area control for pipelines, power transmission, etc. (they all wince when someone points to the DCS (Distributed Control System) in a refinery and tries to call it SCADA).

Introduction – What is SCADA? Where does it come from? SCADA vs.Telemetry



SCADA grew up from space telemetry & control systems

At the time there was very little control...

Why? There was no bandwidth...

SCADA vs.Telemetry

Why? There was no bandwidth...

Water utility in the central valley of Callifornia (late 60s) – 56 wells, 30x40miles

6 pump technicans – just to drive by car between the wells to check the level of chlorine... All day long



Then they invested in the telephony line from each well to the central station.

So that when alarm occured technican knew which station it comes from.

In usual application SCADA refers to the computer system that performs supervisory role over some *equipment*.

Usually this "*equipment*" is a set of PLC controlers or an embedded system ("worker") equiped with a range of sensors to gather an information about the state of the installation.

In parallel to this, workers perform control tasks over the processes in the installation.

By means of communication all the data goes to the central system where it is processed and displayed.

Main functions of the SCADA system:

- 1. Data acquisition
- 2. Data visualisation
- 3. Process control
- 4. Alarm facilities
- 5. Data archive





OpenControl SCADA Network Architecture

Exemplary other architectures:



Data acquisition



Data visualisation



Process control



Alarm facilities



Data archive



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SCADA systems - review

Review of SCADA systems

Adroit – SCADA system along with reporting software OPUS and access through web server (VIZNET). Provider: Adroit Technologies





Key Features and Benefits

- Reduced configuration time
- Reporting Templates
- Seamless Excel analysis
- SharePoint capabilities
- Multiple data sources
- Transform raw data into information



Data acquisition - multiple sources data retrieval



Information repositories – summarised data stored in multidimmensional data warehouses



Information repositories – summarised data stored in multidimmensional data warehouses



Information modelling – the information is modelled into On-Line Analytical Processing (OLAP) cube for efficient analysis Information modelling – the information is modelled into On-Line Analytical Processing (OLAP) cube for efficient analysis.

OLAP is a computer-based technique for analyzing business data in the search for business intelligence.



Operations - SLICE

is the act of picking a rectangular subset of a cube by choosing a single value for one of its dimensions, creating a new cube with one fewer dimension.



Review of SCADA systems - OLAP cubes

Operations - DICE

The dice operation produces a subcube by allowing the analyst to pick specific values of multiple dimensions.



Operations - DRILL DOWN/UP

allows the user to navigate among levels of data ranging from the most summarized (up) to the most detailed (down).



Operations - ROLL-UP

A roll-up involves summarizing the data along a dimension.

Operations - PIVOT

allows an analyst to rotate the cube in space to see its various faces.





Presentation layer – it is about how the information (or key performance indicators KPIs) is presented to end-users

Mitsubishi takes a share of Adroit Technologies

08 April 2011

Following the announcement of the release of the Mitsubishi Adroit Process Suite (MAPS) in November 2010, Mitsubishi Electric Europe B.V has now announced that it is to acquire a 14.9% share in its e-F@ctory partner Adroit Technologies.

The MAPS technology was developed jointly by the two companies to address the traditional shortcomings of traditional PLC-SCADA integration tools.

This single integrated package takes users through all the phases of process design, engineering design, control system design, installation, commissioning, acceptance testing and ongoing maintenance; helping to maintain consistency and integrity within an automation system, improving quality and reducing costs.



and user configurable PLC function blocks and associated SCADA graphics, based on the international S88 and

The Integration of Adroit's (MAPS) SCADA ^gthat reduces the time and effort in automation project design, testing and commissioning phases, with pre-defined

The integration of Adroit's SCADA system into the software of Mitsubishi Electric

Mitsubishi Electric and e-F@ctory Alliance Partner Adroit Technologies have developed a solution with the Mitsubishi Electric-Adroit Process Suite (MAPS) that provides a whole host of advantages in contrast to conventional SPS-SCADA systems. This engineering tool for the complete product life cycle of automation solutions creates a lot of added value for the user, especially in the development and integration phase. In addition, MAPs makes it easier to embed already existing data and allows customers to carry out expansions and maintenance measures independently.

🔊 standards.

Improved quality at reduced costs

MAPS guides the user through all phases of your project, from process design to engineering, development of the control systems, installation, initial start up and acceptance test right up to continuous repairs. MAPs therefore supports consistency and integration of every automation systems and improves quality while reducing costs.



e-F@ctory Partner



Review of SCADA systems - Autolink

Autolink – SCADA system. Provider: ASCON

AutoLink

Data Acquisition and Supervisory Control System

Main features:

- 1. Data acquisition & monitoring
- 2. Process operations
- 3. Library of drivers
- 4. Mimic & pre-formatted pages
- 5. RT & historical trending
- 6. Alarm handlers
- 7. Configurable reporting
- 8. Recipe management
- 9. Security operator levels



Review of SCADA systems - Autolink

Autolink - SCADA system. Provider: ASCON

Event and alarm tracking and management system ensures that operators promptly receive notification of process upsets or abnormal conditions.

Archived data can be displayed via multiple pen charts, which provide precise and complete identification of process variables, as well as time scrolling and zooming capability.

AutoLink

Data Acquisition and Supervisory Control System



Review of SCADA systems - EMAC

EMAC – SCADA system. Provider: ENERGOTEST



EMAC – SCADA system. Provider: ENERGOTEST

Data layer – EMAC allows to acquisite data from range of controllers: PLCs, AD converters, embedded platforms, analysers, flow counters, etc.

Communication layer – EMAC supports a wide range of communication protocols: TCP/IP, Profibus DP, Modbus, Unitelway based on following transmission standards: Ethernet, Profibus, RS 232, RS 485, current loop.

Supervisory layer – supervisory layer is based on local control stations that communicate through client-server protocol.

Review of SCADA systems – GEMOS

GEMOS – Intelligent building management. Provider: ELA COMPIL



Review of SCADA systems – GEMOS

GEMOS – Intelligent building management. Provider: ELA COMPIL



NEUTRALNOŚĆ – stworzony na jednolitej platformie system dostosowany jest do pracy z rozwiązaniami wszystkich producentów.

BEZPIECZEŃSTWO – najnowsza generacja systemów zarządzania budynkiem. Gemos jest systemem najczęściej rekomendowanym przez osoby mające bezpośredni wpływ na bezpieczeństwo obiektu. Stosowany wszędzie tam, gdzie bezpieczeństwo jest najwyższym priorytetem.

INTEGRACJA – integruje systemy sygnalizacji pożaru, dźwiękowe systemy ostrzegania, systemy sterowania wentylacją i oddymianiem, sterowania drzwiami ewakuacyjnymi, kontrolą dostępu, wind itp.

OPTYMALIZACJA – Gemos pozwala zoptymalizować koszty ochrony i obsługi technicznej obiektu.



OSZCZĘDNOŚĆ – umożliwia oszczędną gospodarkę mediami i zasobami ludzkimi.

ERGONOMIA – ułatwia organizację czasu pracy, dzięki nowoczesnej platformie zarządzania.

Review of SCADA systems – Micro SCADA

MicroSCADA – SCADA system from ABB



MicroSCADA – SCADA system from ABB

Power distribution monitoring

- Process displays with network coloring, zooming, panning and de-cluttering
- Event, alarm and blocking lists
- Trends
- Historian for high-performance data logging, refinement, analysis and reporting
- Power-quality monitoring
- Uploading and analysis of disturbance record files

Communication and interfaces

- Solution libraries for ef ficient integration with protection and control IEDs
- Master protocols: IEC 61850, IEC 61107, IEC 60870-5-101/103/104, LON, SPA, RP
- 570/1, DNP 3.0 TCP/serial, Modbus TCP/RTU, ANSI X3.28, I35/P214, ADLP 180, etc.
- Slave protocols: IEC 60870-5-101/104, IEC 60870-5-104, DNP 3.0 TCP/serial, Modbus RTU, RP 570/1, ADLP180, F4F, etc
- Ethernet redundancy according to IEC 62439/PRP
- Open interfaces: OPC, ODBC, Application programming interfaces for application and communication extensions
- GPS time synchronization

Telexus – SCADA system from Atrem

<u>Telexus</u> is a professional telemetry system with advanced methods of data acquisition and management.

It is composed of main three modules: **Data acquisition system** - TPC/IP also GPRS, RS , modems PSTN i GSM Protocols: ModBus, Mbus, GazModem.

Visualisation – flexible system that is based on vector graphics (i.e., user can design screens in for example Inkscape

Data raporting and analysis – professional engine for data processing that involves partial data processing; views persspectives etc. Also it is capable of verification and correction of the data.

Telexus - view screens



Telexus – charts



Wykres dowolnej zmiennej



Przy

Telexus - data sheets

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Telexus – alarms

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Okno przypisywania grup i użytkowników

Telexus - user setup





Uprawnienia do obiektów

SCADA summary

Pratcical use of SCADA systems

Fire alarms (forests etc.)

CCTV (data registration, camera control)

Access control

Evacuation route protection

Failure/process interrupts alarms

Remote control

Sensor data collection

Meter data collection