



WEA – Texas, E&I Committee | Technical Seminar: Advances in Control Systems

Augmenting Operations' Decision Support System with Real-Time and Archived Video

Decision Support System – by definition



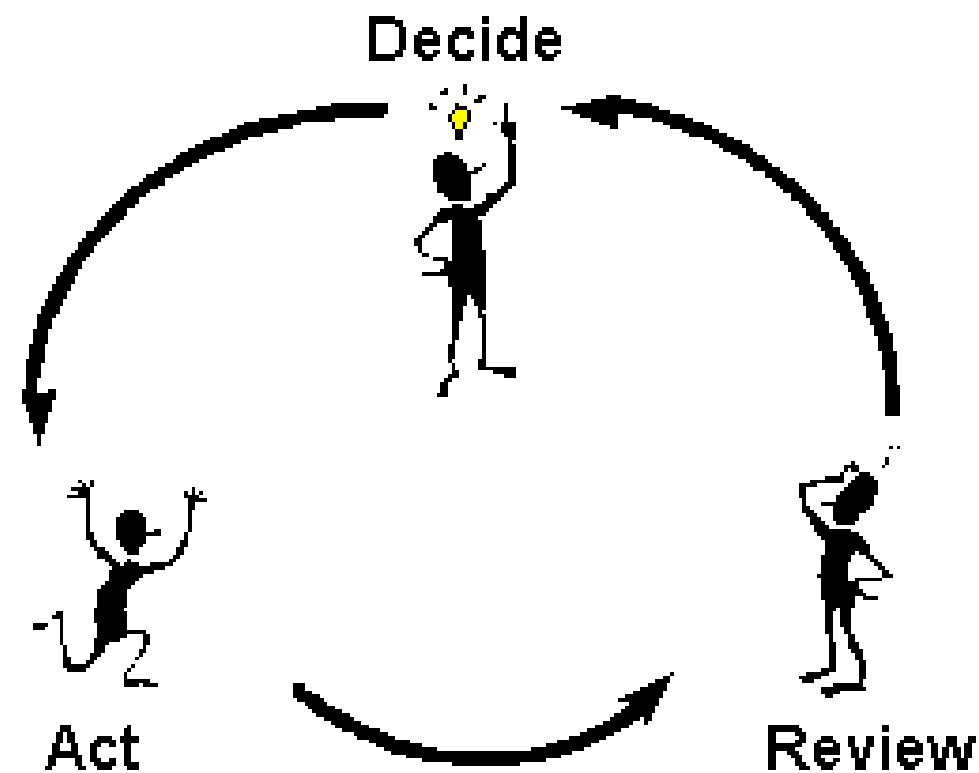
A **Decision Support System (DSS)** is a computer-based information system that supports business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization (usually mid and higher management) and help to make decisions, which may be rapidly changing and not easily specified in advance (Unstructured and Semi-Structured decision problems). Decision support systems can be either fully computerized, human or a combination of both.



Decision Support System – by definition



A **Decision Support System (DSS)** is a computer-based information system that supports business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization (usually mid and higher management) and help to make decisions, which may be rapidly changing and not easily specified in advance (Unstructured and Semi-Structured decision problems). Decision support systems can be either fully computerized, human or a combination of both.

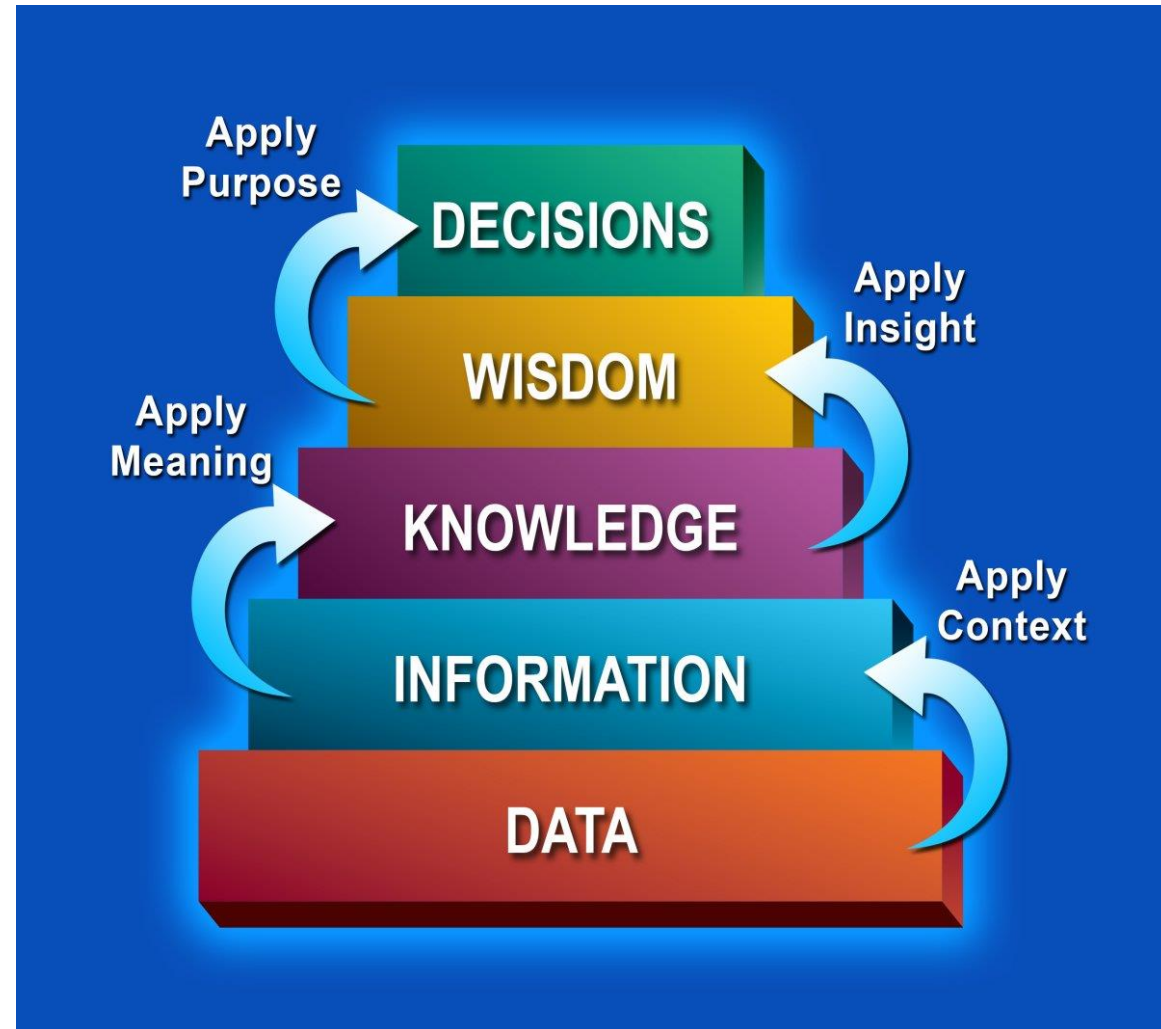


“There is nothing so inefficient as very efficiently doing things that should not be done at all”



Decision Support System – by definition

A **Decision Support System (DSS)** is a computer-based information system that supports business or organizational decision-making activities. DSSs serve the management, operations, and planning levels of an organization (usually mid and higher management) and help to make decisions, which may be rapidly changing and not easily specified in advance (Unstructured and Semi-Structured decision problems). Decision support systems can be either fully computerized, human or a combination of both.





Sprague (1980) defines DSS by its characteristics:

DSS tends to be aimed at the less well structured, underspecified problem that upper level managers typically face;

DSS attempts to combine the use of models or analytic techniques with traditional data access and retrieval functions;

DSS specifically focuses on features which make them easy to use by noncomputer people in an interactive mode;

DSS emphasizes flexibility and adaptability to accommodate changes in the environment and the decision making approach of the user.

From Wikipedia, the free encyclopedia



SCADA = Supervisory Control and Data Acquisition

- (SCADA) Systems are used in industry to monitor and control plant status and provide logging facilities. SCADA systems are highly configurable, and usually interface to the plant via PLCs.



DSS = Decision Support System

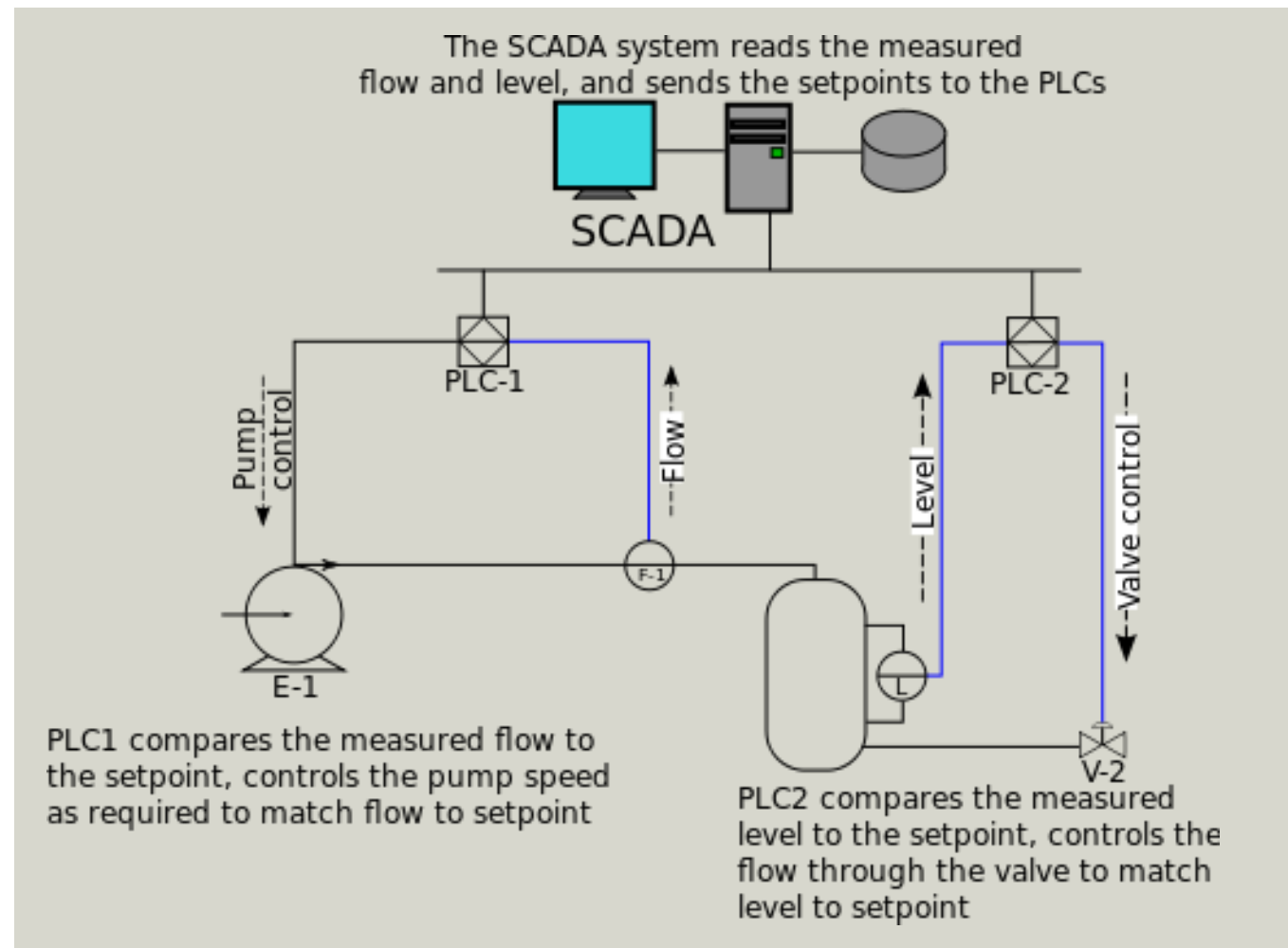
- DSS users see DSS as a tool to facilitate organizational processes. Some authors have extended the definition of DSS to include ***any system that might support decision making ...***

SCADA system as a DSS ...

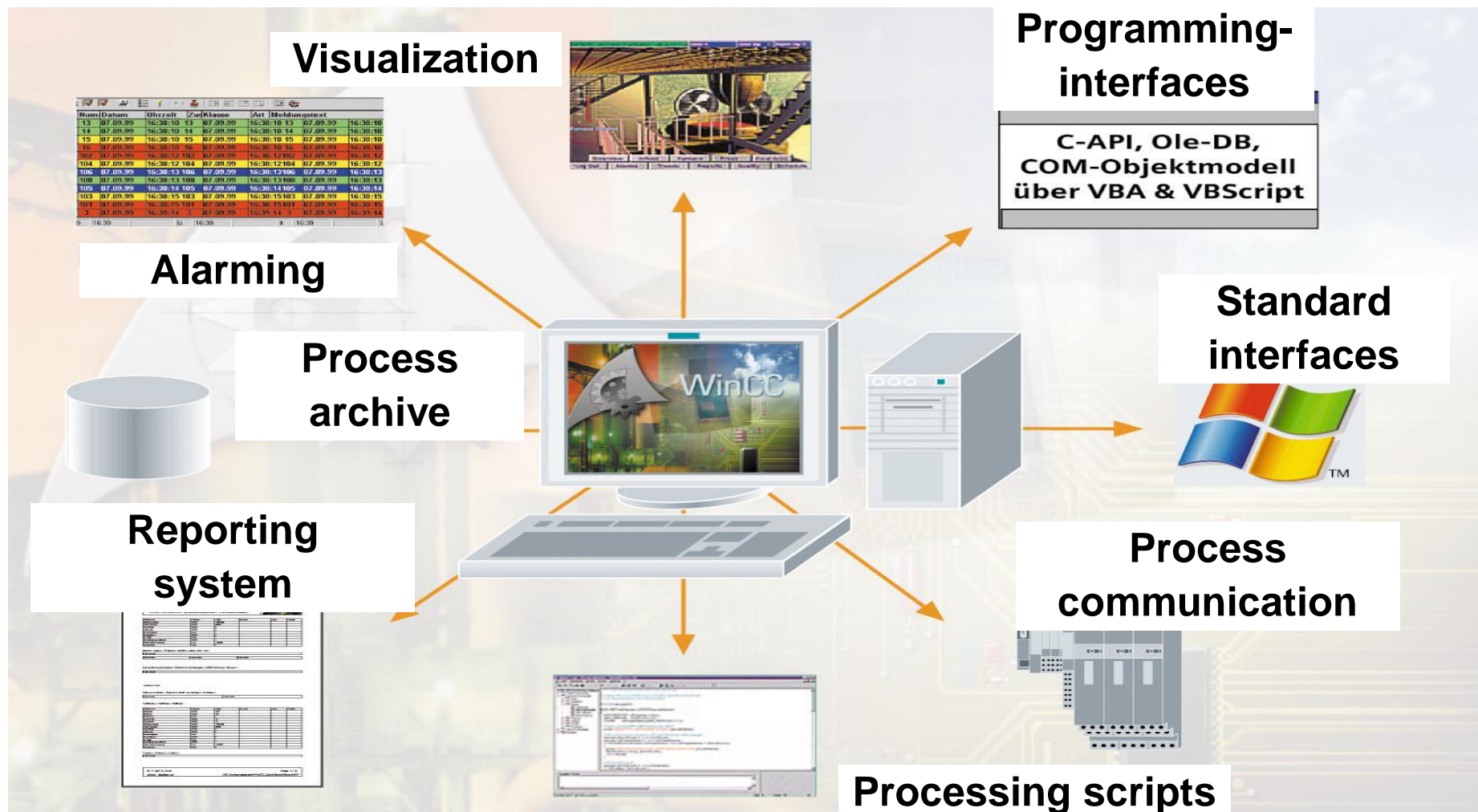


The term SCADA (Supervisory Control and Data Acquisition) usually refers to centralized systems which monitor and control entire sites, or complexes of systems spread out over large areas (anything from an industrial plant to a nation). Most control actions are performed automatically by RTUs or by PLCs.

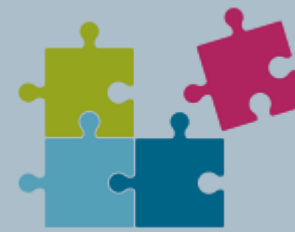
Host control functions are usually restricted to basic overriding or *supervisory* level intervention.



Major functionalities of SCADA



Common SCADA Functionality



SCADA Industries



Discrete

Automotive (OEM & Suppliers)

High Tech

Semicon.

Packaging



Process

W/WW Utilities

Oil and Gas

Chemicals



Hybrid

Food and Beverage

Pharmaceutical

Metals

Mining

Printing



Infrastructure

Building Automation

Transportation



Why add VIDEO functionality to SCADA ...

Vision & Motivation



Trends/ Challenges

- Need for real-time visualization augmentation beyond that provided by animated 3D graphics
- Operational knowledge gaps
- Globalization and multi-national workforce
- Decrease in cost for IP-cameras
- Standardization amongst video OEMs



Answers

- Running select/critical video feeds into SCADA helps visualize beyond the ‘cartoons-on-screen’
- Video affords less interpretation of the graphical icons and their “intended” animations; seeing is believing ...
- Integration with the SCADA alarm & event engine allows perfect synchronizing of the video to the monitored process parameters
- Archived video for forensics

Motivation



Video surveillance systems have been operated mostly as a local stand-alone solutions. Even today, analog and digital video components are still used side by side with each other, as it is often more economical for the extension of existing video systems to integrate existing analog equipment, rather than replace all the video equipment in one fell swoop.

Nevertheless, typically only a single OEM of digital video components is used in these hybrid video systems usually, which at first increases the dependence on these manufacturers, but also makes the communication with other systems more difficult.

As part of the ongoing consolidation of control rooms SCADA and VIDEO systems are moving closer together, interacting more with each other and are being served by the same operators increasingly.

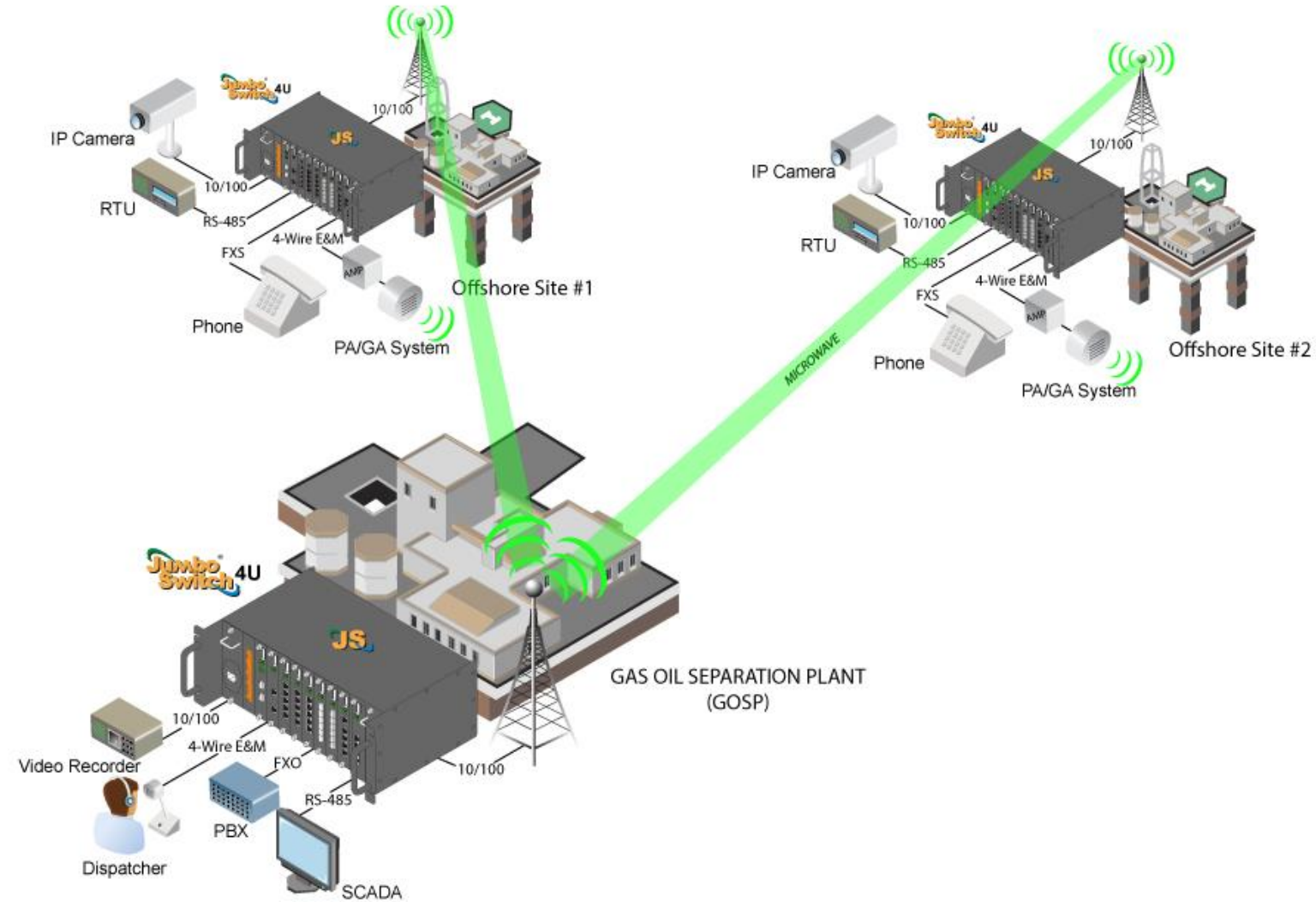
Best Practices from Transportation SCADA



ID	Time	Location	Alert Type	Status	Priority	Category
A 230	11/21/2013 1:25:16 PM	402	Tank farm Vienna West - Alert	Sum alert	WENT TRUE	med
A 230	11/21/2013 1:25:19 PM	117	GIS - Alert	Sum alert	CAME TRUE	med
A 230	11/21/2013 1:56:42 PM	013	Shadras - Alert	Sum alert	WENT TRUE	high
A 230	11/21/2013 2:11:35 PM	925	New Features - Alert	Sum alert	WENT TRUE	high

Borrowing a lesson learned from the folks in the Intelligent Transportation Systems world, utilization of “live” streaming video is a must have functionality for their Industry ...

Example of Unmanned Off-Shore Platforms

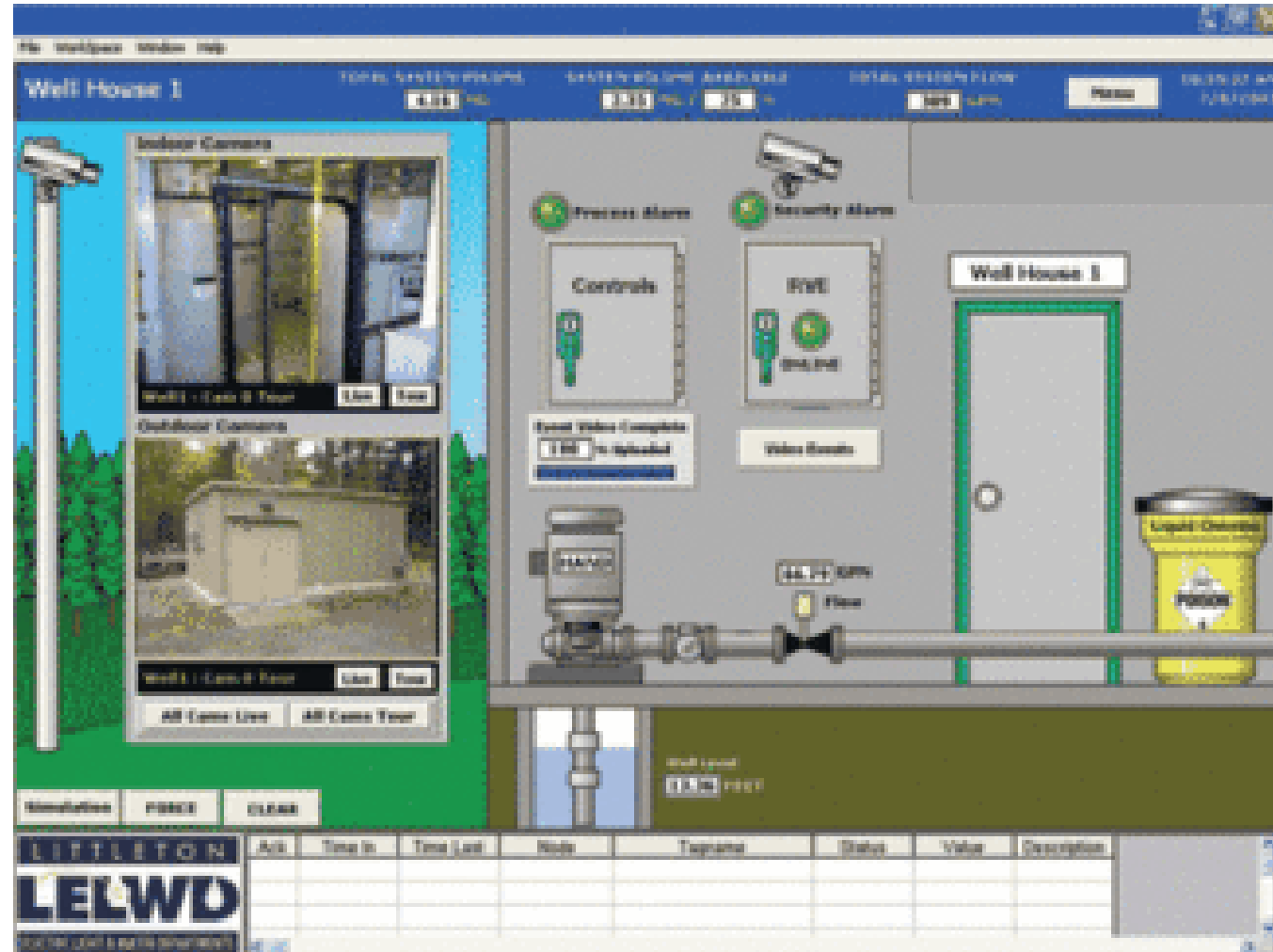


Capturing “live” streaming video from either of these two platforms – especially during an incident or alarm state, would be beneficial to the land based Operators in order to aide their decision making process ...

Example of an Unmanned Sewer Lift Station



Intrusion detection scenarios can also be monitored and incorporated into the Utilities first response decision making process ...



SCADA enhanced with VIDEO functionality



The concept would be to enable native integration of video management functions in an open SCADA project, e.g. in a plant control system. This native integration allows the system integrator to configure video hardware and video software in the same manner as it is usual in the classical plant automation hardware.

This allows highly customized project-specific architectures, video features and user interfaces to be implemented by the system integrator for the customer.

Due to the open architecture of most SCADA systems these individual project solutions can be maintained and enhanced in the long term. As with most SCADA applications, the project-specific video application changes can be made during system operation.

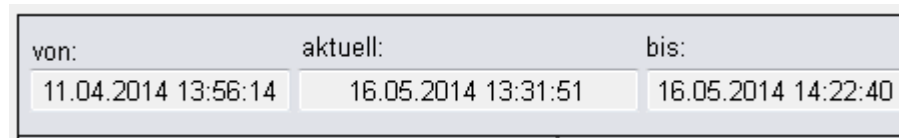
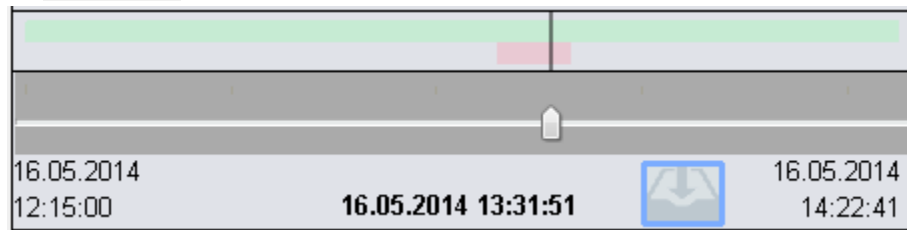
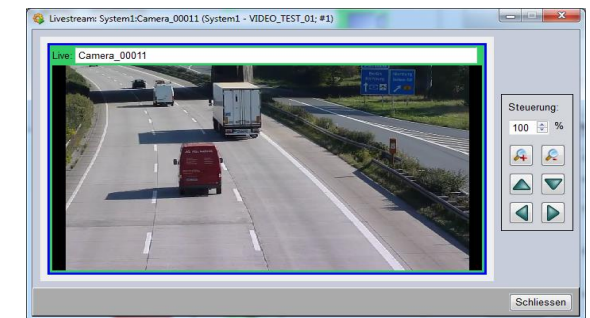
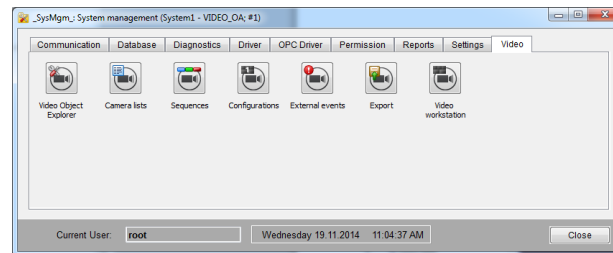


VIDEO – Symbol library and panel example

- Graphical symbols and examples allow quick and easy integration of the video subsystem into their own SCADA project application
- All components are SCADA symbols and can be adapted in the application

Kamera	von	bis
(00002) USB Kamera	07.05.2014 10:40:00	07.05.2014 10:51:00
(00002) USB Kamera	07.05.2014 10:40:02	07.05.2014 10:55:02
(00003) Bosch Flexi Dome	16.05.2014 12:15:00	16.05.2014 14:22:40
(00002) USB Kamera	16.05.2014 12:15:00	16.05.2014 14:22:40
(00004) Bosch Dinion IP	16.05.2014 12:20:00	16.05.2014 14:22:40
(00001) AXIS Kamera	16.05.2014 12:20:00	16.05.2014 14:22:41
(00003) Bosch Flexi Dome	16.05.2014 13:24:00	16.05.2014 13:35:00
(00004) Bosch Dinion IP	16.05.2014 13:24:00	16.05.2014 13:35:00
(00002) USB Kamera	16.05.2014 13:24:00	16.05.2014 13:35:00
(00001) AXIS Kamera	16.05.2014 13:24:00	16.05.2014 13:35:00

Nummer	Beschreibung	Live	Playback
(00001)	Portalkamera Nord	[icon]	[icon]
(00002)	Portalkamera Süd	[icon]	[icon]
(00003)	Ausfahrt Musterstadt	[icon]	[icon]
(00004)	Testkamera 4	[icon]	[icon]
(00005)	System1.Camera_00005	[icon]	[icon]
(00006)	System1.Camera_00006	[icon]	[icon]
(00007)	System1.Camera_00007	[icon]	[icon]
(00008)	System1.Camera_00008	[icon]	[icon]
(00009)	System1.Camera_00009	[icon]	[icon]
(00010)	System1.Camera_00010	[icon]	[icon]
(00011)	System1.Camera_00011	[icon]	[icon]
(00012)	System1.Camera_00012	[icon]	[icon]
(00013)	System1.Camera_00013	[icon]	[icon]
(00014)	System1.Camera_00014	[icon]	[icon]
(00015)	System1.Camera_00015	[icon]	[icon]
(00016)	System1.Camera_00016	[icon]	[icon]
(00017)	System1.Camera_00017	[icon]	[icon]
(00018)	System1.Camera_00018	[icon]	[icon]
(00019)	System1.Camera_00019	[icon]	[icon]
(00020)	System1.Camera_00020	[icon]	[icon]
(00100)	System1.Camera_00100	[icon]	[icon]

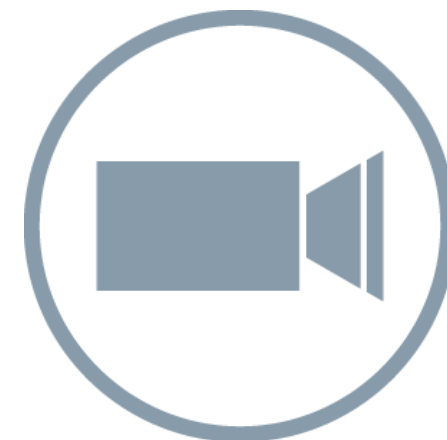


SCADA and VIDEO management in one system



Video management features in modern SCADA systems should provide:

- Software based, digital and vendor neutral video management system
- “Native” integration of video management functions into a SCADA project
- Integration of the vendor neutral video standard ONVIF (Open Network Video Interface Forum)
- <http://www.onvif.org/Home.aspx>



- Consistent and central operation
- Tight integration of VIDEO and SCADA functionality
- Connection by means of various techniques to different hardware
- Cost savings in operation and maintenance



Benefits of SCADA with integrated VIDEO functionality

- Freely scalable standards based solution
- Flexibly to fit most all project requirements
- Can be made redundant, if necessary
- Fully integrated into the SCADA environment:
 - VIDEO can be integrated into any application as simple subproject
 - It can be operated in parallel to the SCADA system in a common system, as well as a separate system in the composite system as a distributed system
- VIDEO systems in the composite system can display live or playback images in their user interfaces
- VIDEO can access all process data in the composite system, respond to its changes and allow so an easy interaction between video and automation technology



“Live” VIDEO Streaming in SCADA

Offers the easy possibility to integrate lower cost IP-cams, IP-components and complete video management systems into SCADA

Capabilities:

- for ‘legacy’ Infrastructure, Traffic & Transportation and Building Automation projects
- for new “greenfield” projects or modernization of existing applications

Benefits:

- **Reduced interfaces** due to the use of just one single user interface (although diverse systems)
- **Enlargement of existing SCADA applications** with digital video components
- **Reduction for training cost, maintenance and cost of operation**





VIDEO - Basic functions

- Integrate **video streams** in the network via ONVIF 2.0 interface
- Display of **live images** via video widget in SCADA system screens
- Interfaces to **PTZ (pan/tilt/zoom) cameras**
- **Standard graphic object library** for easy creation of SCADA screens with video objects
- **Automatic switch to camera image in case of alarm**



SCADA with VIDEO - Enhanced functions



Software multi-decoder for realization of a **video wall** with standard-PC hardware

- Variable video grid:
 - 1, 4, 6, 12 or 24 videos in parallel per monitor
- Free scalable display server windows
 - Scalable through multi-monitor support
 - Scalable through parallel operation on one video wall
- SCADA graphic object for the configuration of the video wall





VIDEO - Free choice of video techniques

- **Image sources according to ONVIF 2.0 (Profile S)** are supported
- Additionally the common image source standard **RTSP** is supported
- Proprietary image source standards from the following manufacturers are supported:
 - **BOSCH** (Cameras & Encoder)
 - **Mobotix** (Cameras)
 - **Moxa** (Cameras & Encoder)
 - **Sony** (Cameras)
 - **Axis** (Cameras & Encoder)
- Cameras and video encoders with following video compression methods are capable:
 - **H.264**
 - **MPEG4**
 - **Motion JPG**



- List of supported video technology is constantly expanding
- Proprietary protocol implementations can be offered short-term



VIDEO - HID controller

- **Joysticks** and **jog shuttles** connected via USB can contribute to the control of cameras and playback
- Joysticks and jog shuttles, which are identified by the USB-interface as a human interface device may be used
- Axis movements and keystrokes are mapped to data points and can be used in SCADA application
- Hardware recommendations:



Axis T8313 Jog Dial



Contour ShuttleExpress



Axis T8311 Joystick

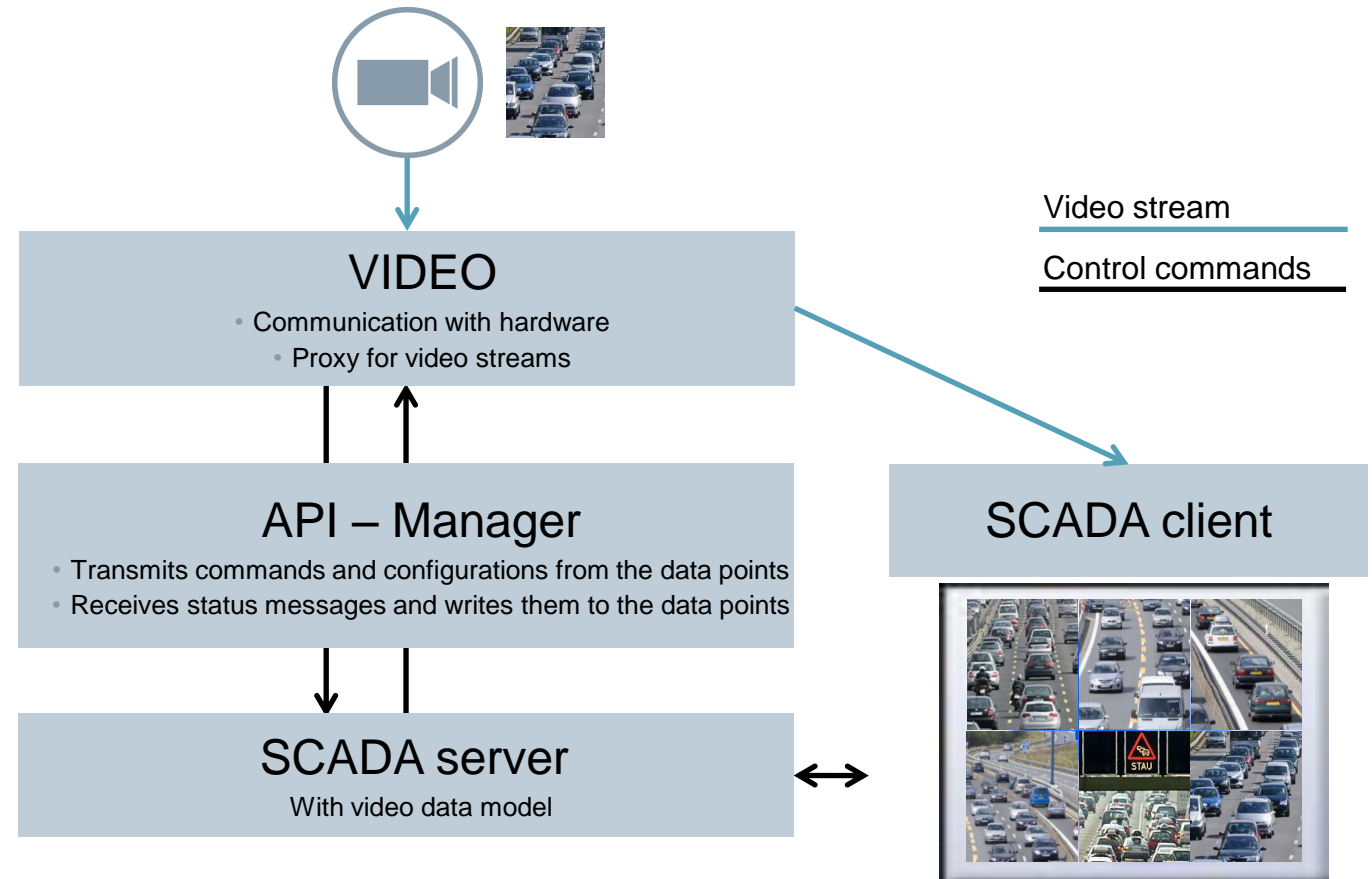


Logitech Extreme 3D Pro

VIDEO - Architecture



- VIDEO runs as an own software component
- VIDEO can be used on SCADA server or on own PC hardware
- Video data and SCADA data are completely decoupled



VIDEO - Communication



- Bundles all video streams and distributes them to all recording or displaying components
- The streams are processed in the supplied source image format
- Suitable for all standard hardware components
- With following video components can be communicated via TCP/IP connection:
 - **IP cameras**
 - **Encoder**
 - **Analog cross bars**
- A multicast connection to the camera can be used on request

Anyone Familiar with a TiVo[®] – DVR ?

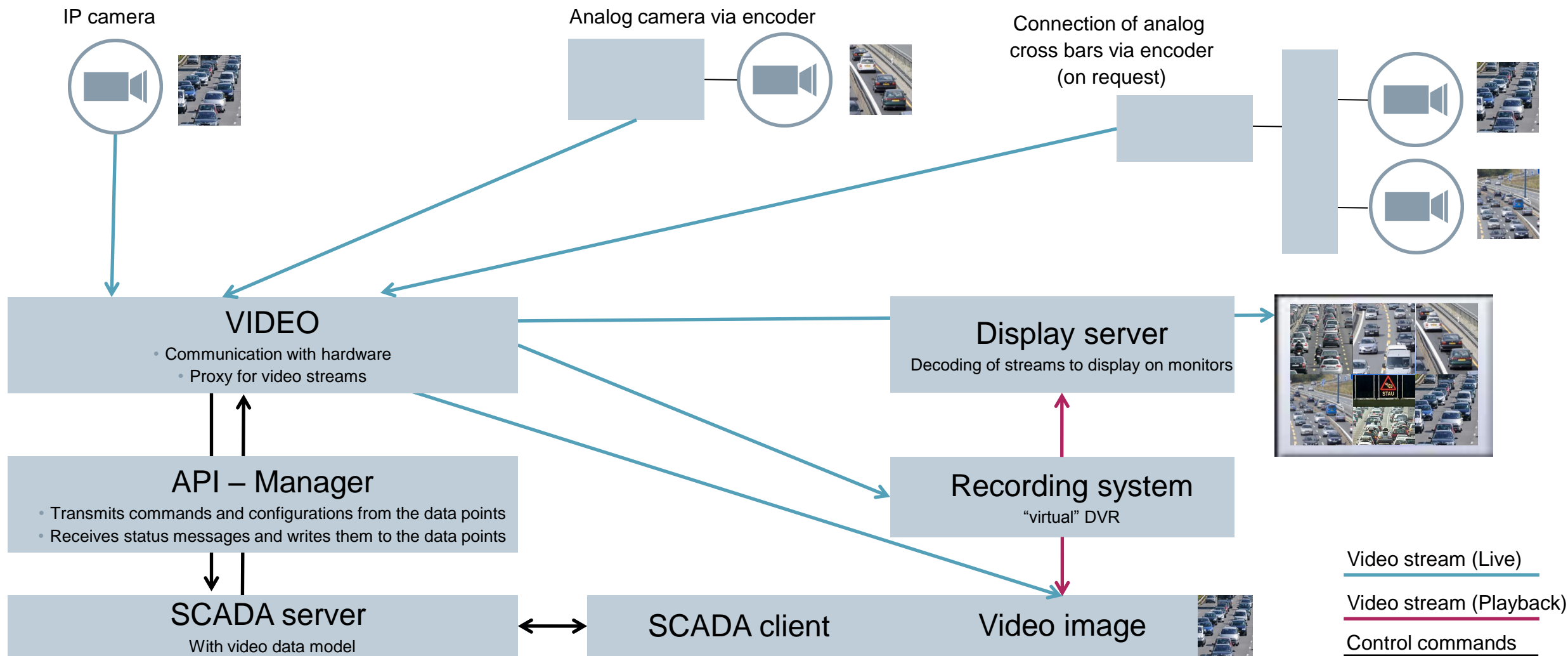


Digital Video Recorder - DVR



Why not use a 'virtual' one in your SCADA system software ?!?

VIDEO – Architecture with DVR



VIDEO - Supported video techniques

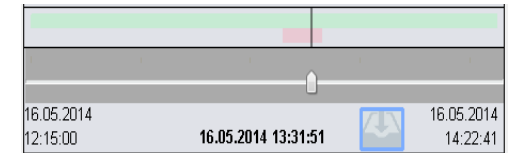
Virtual Digital Video Recorder (DVR) ...



A “virtual” DVR provides a pure software-based recording system for recording video images, that works with standard hardware components as a recording medium.

Functions:

- **Redundant recording:** Image material is saved redundantly
- **Load Balancing:** Cameras are split into different video recorders. In case of failure another recorder takes over the recording. For playback the image material is merged automatically
- **Ring recording** including event-driven setting of an overprint lock
- **Event-driven recording with pre- and post-time**
- **Recording for the time period of camera switching**
- **Export of the recorded video streams including time information**
- **Synchronous playback of several recordings**
- Recording directly on the SCADA server (for small systems)



SCADA system with VIDEO

Supports all known system configurations



Single-user system

all basic SCADA components and VIDEO components run on one PC

Redundant system 1

all SCADA components and VIDEO components run on the respective servers

Redundant system 2

SCADA components and VIDEO components run on the respective own servers (4 PC's)

Distributed system

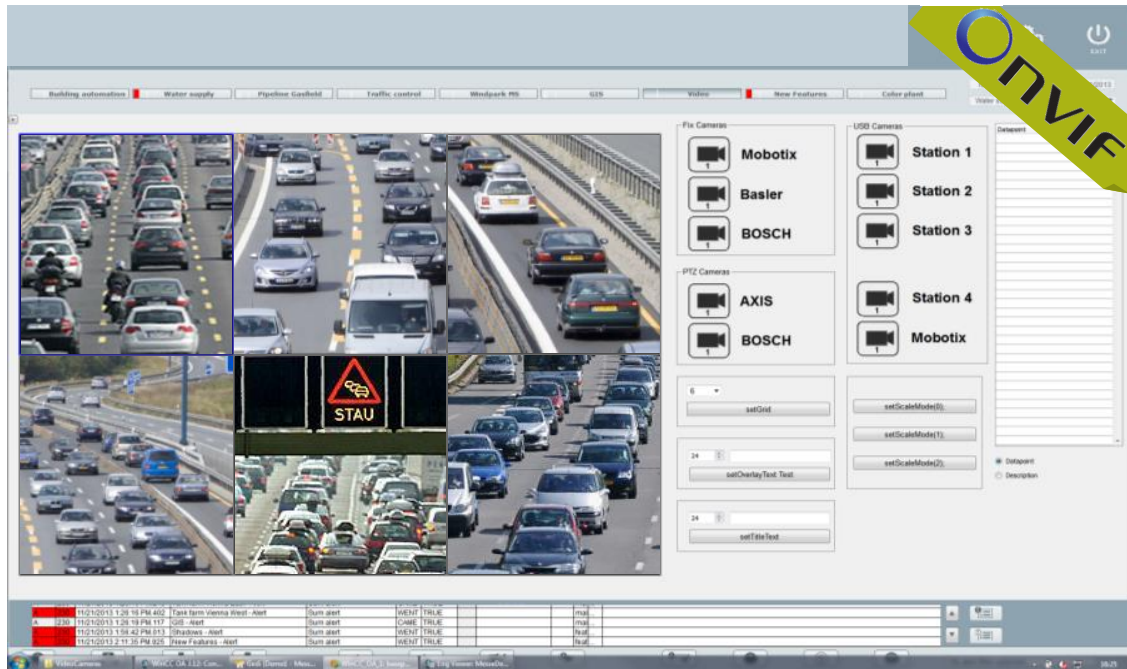
All SCADA clients in a distributed system have access to all VIDEO streams in the system, even if they contain no video management component themselves

In Summary – embrace software-based, digital and hardware-neutral video management systems for SCADA



VIDEO enhancements for SCADA

- Complete video management system with digital video recording, video buffer, alarm recording and sequence control



Benefits

- Native integration of video management functions (Streaming, recording,...)
- Supports the hardware-neutral video management standard ONVIF 2.0
- Automatic recording in alarm situations



Contact Information



Siemens Industry, Inc.

Carl Hoffman

SCADA Business Developer

HMI Center of Competence

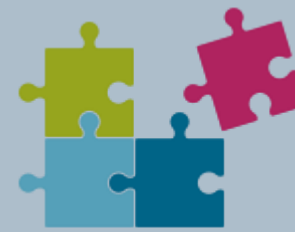
Plano, TX 75024 USA

Phone: +1-951-760-1198

carl.hoffman@siemens.com

siemens.com/answers

SIMATIC SCADA Systems website URL



SIEMENS

SIMATIC SCADA Systems – Efficient to a new level

SIEMENS | Deutsch | Contact | Index | Site Explorer | Search

> Home > Industry > SIMATIC > SCADA Systems

SIMATIC SCADA Systems

In factory automation as well in infrastructure applications, Siemens SCADA systems are redefining efficiency. Both SIMATIC WinCC V7 for operational management as well as SIMATIC WinCC Open Architecture for applications with highly customer-specific adaptation requirements support international standards and platforms. This makes it easy to integrate in existing hardware and provides for seamless integration in the IT world. Mobile solutions and innovative operating concepts ensure easy, rapid access to plant information, while extensive safety standards prevent operating errors.

Siemens SCADA systems are scalable throughout the entire lifecycle, making it possible to expand existing systems at any time. That means investment security. Whether single-user systems, multi-user systems, or even widely distributed systems: you can use Siemens SCADA systems to visualize machines, lines, and entire plants and thus ensure transparency. As a result, you can identify optimization potential, minimize downtimes, and guarantee a short time-to-market.

Product links

- SCADA System SIMATIC WinCC
- SCADA System SIMATIC WinCC Open Architecture

Brochure:

SIMATIC SCADA systems
The right SCADA system for every application

- read as E-Book
- ↓ PDF Download PDF

References

Driving Total Control
Aston Martin utilises
Siemens Industry solution
to enhance information
transparency at manu-
facturing headquarters.

- ↓ PDF Download PDF

UniEnergy Technologies - Wind Park Battery
System based on WinCC OA controls large-
scale energy storage systems

SIMATIC SCADA Systeme
Efficient to a new level

SIMATIC SCADA systems at a glance
Learn how SIMATIC SCADA systems help you today to meet the challenges of tomorrow

www.siemens.com/scada