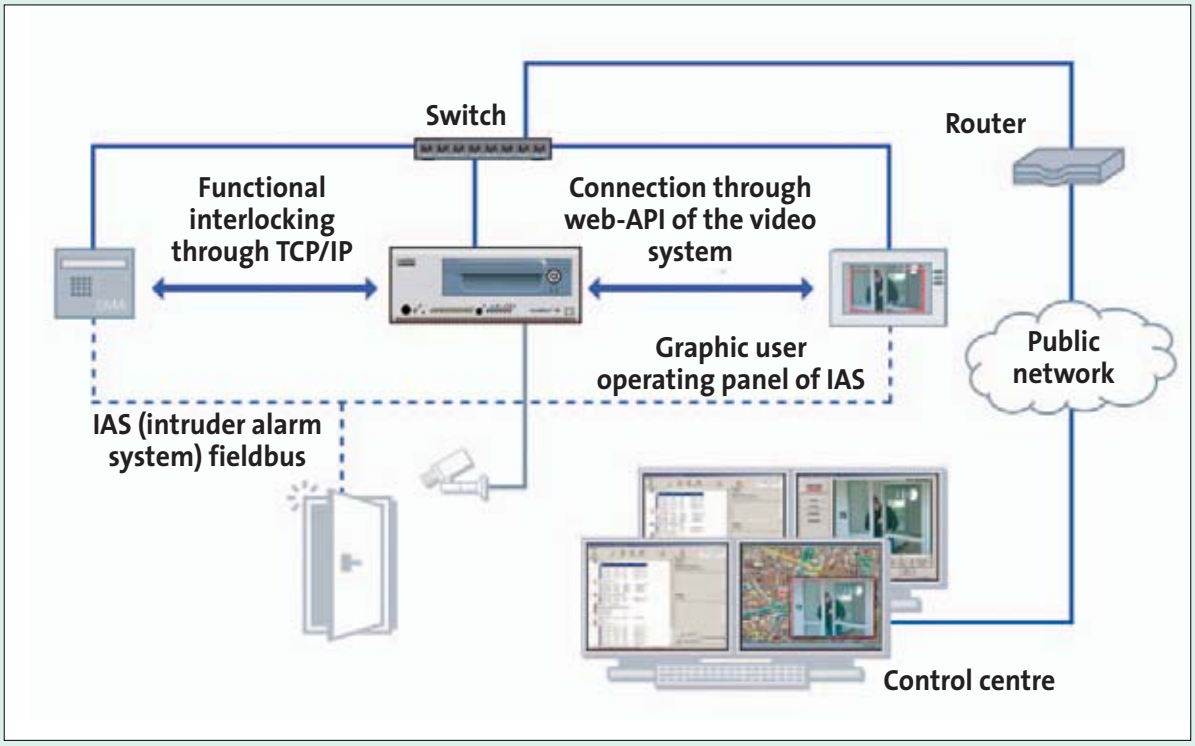
CCTV surveillance and intruder alarm systems based on TCP/IP and the VdS 2465 transmission protocol

AUTHOR: ULRICH SCHWIEGER



Schematic illustration of integration of intruder alarm and CCTV technologies

System integration in safety engineering

Installers of safety and security technology are constantly challenged to adapt to changes in infrastructure and overall conditions. There is a growing demand for security concepts that ensure integration across all security sectors, including the system and network levels as well as super ordinate management systems.

Against this backdrop, vendors are faced with the challenge of developing equipment and systems which are almost all-in-once devices covering every conceivable requirement. There is a demand for equipment and systems that can easily be integrated in existing security concepts. If possible, standardised interfaces should be applied.

In this context, there is certainly a predominant interest in intruder alarm, access control and video (CCTV) surveillance systems and technologies.

Each of these sectors has undergone a continuous development during the course of which the functional focus and the overall marketing conditions have changed. As a result, users had to deal with different suppliers in the past if they wanted

to introduce a comprehensive security concept. In general, they had to deal with installers specialised in the different security sectors: Installer A for IAS, B for access control and C for CCTV etc.

This has now changed: Installers are no longer specialised in one security sector but tend to offer a complete package, so-to-speak as single-source suppliers.

The customer is able to enjoy the benefit of a single service provider for the security package. Moreover, it has become apparent that a system integration, that is, a functional integration of individual sectors does not only provide added value for the customer but also improves the effectiveness of the safety-related functions across different systems.

CCTV surveillance technology is increasingly applied as an integral part of security concepts, both in private and commercial applications. This trend is also reflected in the current draft guidelines of VdS and the object-specific requirements of insurers.

However, the realisation of such turnkey systems presents considerable obstacles to installers.

CCTV surveillance systems as part of alarm systems can be integrated across different vendors only to a limited extent due to the lack of standardised interfaces.

VdS has addressed this problem and is developing a set of standards for CCTV surveillance that paves the way for including video technology in comprehensive security concepts.

Overview of current VdS guidelines and/or draft guidelines on CCTV

Certification process

VdS 3442 2005-09 Richtlinien für die Anerkennung von Errichterfirmen für Videoüberwachungsanlagen (VÜA), Verfahrensrichtlinien (Guidelines for approval of installers of CCTV surveillance systems, procedural guidelines)

Planning and installation

VdS 2366 2004-05 VdS-Richtlinien für Videoüberwachungsanlagen, Planung und Einbau (VdS guidelines for CCTV surveillance systems, planning and installation)
VdS 3426M 2005-09 Installationsattest für eine Videoüberwachungsanlage (VÜA), – Muster – (Installation certificates for CCTV systems – sample)

Products

VdS 2364 2006-08 Systemanforderungen, Kategorie I (System requirements, category I (draft))
VdS 2365 Systemanforderungen, Kategorie II (System requirements, category II (draft in progress))

The draft guidelines VdS 2365 on "Requirements for CCTV surveillance systems of category II" is of special importance from the point of view of system integration.

In contrast to category I which covers video systems as separate components that do not have any influence on nor are they in integral part of intruder alarm systems, CCTV systems of category II can be functionally integrated into alarm systems.

VdS 2365 focuses primarily on one out of three integration levels, which is the system level.

Moreover, when taking a holistic approach, special requirements arise for the communication infrastructure and on the level of control room and management systems.

Regarding control rooms and management systems, the integration of a video functionality in (existing) alarm management systems and system integration under a sole user interface are of primary importance.

In terms of overall infrastructure conditions, both the alarm system and the CCTV system should be able to use the existing communication infrastructure.

The requirements on the system level predominantly relate to the functional connections of the different security sectors and the automation of operating and functional processes.

General requirements for a CCTV system from the perspective of "integration into alarm systems" on the system level

In general, the design of the CCTV system's architecture has to meet the special requirements of the alarm system's technology. This applies to both the hardware and the software of the CCTV system. The operating systems installed need to be suitable for security applications; in general, an embedded system design is required for both the hardware and the software, which can ideally also be integrated into a battery-operated emergency power supply system with a rated voltage of 12 V.

Moreover, the systems need to be multi-link enabled for connection to management systems or distributed security control rooms. Simultaneous establishment of multiple video connections across different networks towards different target systems is required.

Similar to alarm transmission, the connection of CCTV systems by public networks may also require a back-up function, a redundant transmission path in order to ensure connectivity to the control rooms also in case the main transmission path is offline.

However, the most important aspect is a suitable system interface that provides the functional link between the CCTV system and the alarm system.

The guidelines of category II address this subject in greater depth and, among other things, describe a system interface for the connection of the CCTV system to the alarm system in detail.

What are the requirements for a system interface for CCTV and alarm systems?

- 1. The interface has to feature the functionalities of both systems.
- 2. Due to the different EMC protection concepts of CCTV and alarm technologies, a galvanic isolation is required.
- 3. The interface has to be standardised to ensure integration of different systems by different vendors. Proprietary processes are not suitable from the point of view of a safe investment.
- 4. Highest functional reliability with permanent crosschecking of availability.

At first glance, it is not an easy task to define an interface that meets this profile and that provides an opportunity and motivation for different vendors in the field of CCTV technology and alarm technologies to realise with manageable development and reasonable input.

However, the members of VdS 2365 working group were able to benefit from an interface already standardised by VdS which, in terms of its quality, functionality and performance, met most of the required criteria: VdS 2465 for TCP/IP in line with VdS 2471, Annex A13 (interface S_2/S_3 for connections to IP networks using TCP protocol).

This interface which has already become established for alarm transmission and is used for a safe connection of alarm systems to alarm receiving equipment, forms the basis for a standardised system interface for alarm and CCTV systems. Only minor modifications and protocol extensions were required to ensure the capacity and performance required for video applications.

Hence, the interface now fully meets all requirements. Galvanic isolation is ensured by ethernet coupling, permanent monitoring of functionality is realised through a permanent connection between alarm and CCTV system. The systems' functionality can be reproduced by the protocol elements of VdS 2465. Integration can be done by including existing IP networks that also connect the video and alarm receiving elements. CCTV and alarm systems are directly connected by an ethernet that can also be connected to emergency power supply in order to ensure availability.

What are the functionalities of the new interface for alarm and CCTV systems?

First of all, we would like to highlight that the interface is NOT able to transmit video images or sequences, which is not a requirement in this context.

The interface is conducive to functional integration, mutual control and realising interactions across different systems.

For instance, including system status into the coerciveness of the intruder alarm system is possible. The CCTV's system status may be produced and controlled through operating and display functions, e.g. by activation of the camera's masking detector or by turning or defocusing selected cameras.

System malfunctions of the CCTV system can be transmitted specifically to the emergency service control room by the transmission unit of the IAS.

The video analysis functions or other detection mechanisms of the CCTV can also be used by the alarm system; thus, intruder alarms can be generated by components of the CCTV system, provided that the CCTV system complies with the relevant VdS requirements for the respective security class.

On the other hand, it is also possible to control the CCTV system through the operating status of the alarm system. This includes functions such as controlling video recording or incident-related control of video connections to control rooms or local video monitors. When switching operations are documented it is possible to e.g. reproduce the data stored on the identification device through video images and/or to match these data with the respective video sequences recorded.

All these functions had already been realised in the past, though only rudimentarily, and cost-intensive extensions on the basis of manually wired system extension modules on the basis of potential-free inputs and outputs or super ordinate management systems with proprietary and costly interfaces were required.

Connection to distributed management systems and emergency service & control centres

Implementing comprehensive security concepts does not only involve integration at system level; it is also necessary to consider the connection of integrated systems that consist of CCTV and alarm technologies to distributed emergency service & control centres.

For many control centres, video transmission is a critical issue which is becoming a core business sector in addition to classical alarm transmission. This is no longer about alarm verification and functional testing; nowadays, there is a demand for video-based services such as e.g. automatic patrols by security guards or decentralised live monitoring of operating and switching processes.

Therefore, operators of emergency and service control centres are well advised to carefully examine existing video management and/or video reception systems to check to what extent they meet current and future requirements for continuity, safe investment and integration capability.

One of the primary requirements is integration capability into existing management systems. Control centres that look into CCTV options, in general, use separate video management and reception systems to begin with. A growing number of

video connections then prompt them to add to the number of video workstations.

The smartest solution for control centres that already have a modern management system is integrating video technology into the existing system.

The video reception technology is integrated into the existing infrastructure and, from the perspective of the control centre's system, works almost like a modern alarm reception system. The video server can be connected through e.g. a high-performance TCP/IP connection. This way, the control centre's operator avoids duplication of data update for the objects equipped with CCTV and intruder alarm technologies since they are able to use the database of the control centre's software. Moreover, it is not necessary to install additional workstations since CCTV technology can be integrated into the familiar system interface.

Many vendors of modern alarm management systems are already offering appropriate integration features.

Network and communication infrastructure

This is the sector where concepts are needed that enable a smooth integration of CCTV systems and alarm systems into existing private and public IP networks.

In the sector of CCTV technology, processes such as HTconnect have become established; they ensure a safe connection of video systems to distributed control rooms or video management systems over the Internet. On the object side, Internet access can be equipped with dynamic IP addresses. Access to the systems does not pose any problems as no additional network services are required. Moreover, customer networks can be shielded specifically by firewalls to prevent external access. External access to video systems through target systems that are connected by HTconnect is, however, possible at any time. Moreover, HTconnect enables access to video systems in UMTS networks; again, using costly network services, which is otherwise obligatory, is not needed. There is also a pleasant side effect for the installer: Elaborate configuration of the customer's router (Port Forwarding, Network Address Translation) is not needed.

In terms of transmission security and network availability, some vendors already meet the requirements of VdS (VdS 2471) for the use of IP networks. In case the main transmission path fails, these systems, in principle, make it possible to switch to another VdS-approved transmission path, e.g. ISDN. The system components required for that (e.g. ISDN interface) can be easily integrated into the equipment as additional printed circuit boards.

If special, highly effective image compression processes such as HTcompress are used; no channel bundling is required for ISDN transmission. This ensures a high functional reliability particularly for integrated systems since the alarm transmission device can make unlimited use of the remaining channel B.

Another important aspect is active bandwidth management of the CCTV systems to secure users' business processes while at the same time using the existing communication infrastructure.

Conclusion and outlook

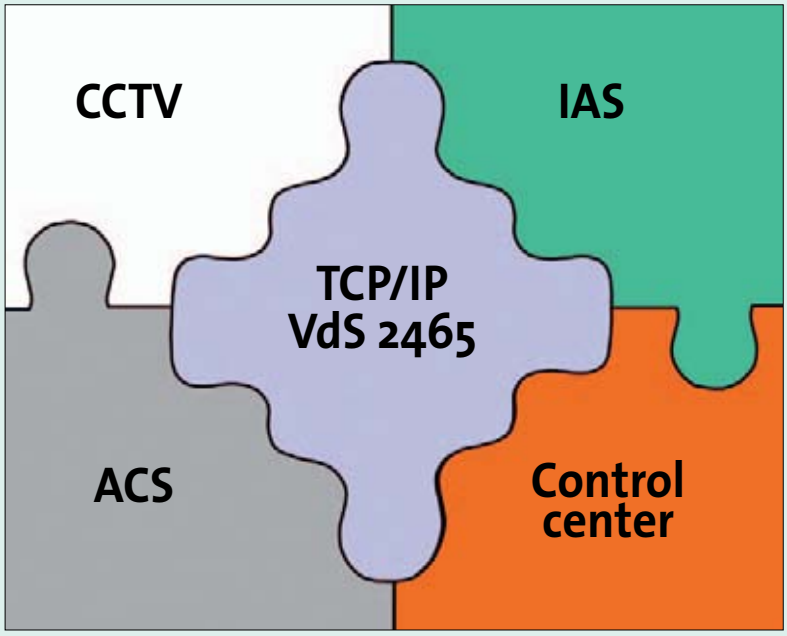
The new VdS guidelines currently being drafted, VdS 2365 on system requirements for CCTV systems, category II, make it possible to realise comprehensive security concepts across different vendors. They will present the first products that are equipped with the new system interface as early as this year's Security trade show in Essen (Germany).

However, the multitude of options that arise from "integrated systems" has not been fully exploited yet. Current interest focuses on the use of control panels of alarm systems for incident-related representation of video archives or live images. Many vendors have already created the basic prerequisites, increasingly using systems for the control panels of alarm systems that do not only feature the obligatory fieldbus connection but also ethernet interfaces. Vendors of CCTV systems, on the other hand, are offering corresponding WEB-API that provides external systems with access to the live images or video archives.

First approaches can already be seen, using, for instance, PDA or smartphones to control or operate alarm systems through WiFi, GSM or UMTS networks and trying to access live images or video archives.

The author of this article, ***Ulrich Schwieger,*** ist head of Productmanagement at HeiTel Digital, Stuthagen, Germany.

Contact: schwieger @heitel.com



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