

# Integration of alarm security systems

**Abstract.** The alarm security system is increasingly used in industrial, commercial or residential buildings. Since there is an increasing demand for several types of security systems, a suitable solution is to integrate them, thereby speeding up and making their communication between individual systems more efficient to minimize the risk of threats. The most common security systems suitable for integration with an alarm security system are a fire detection and fire alarm system, a camera system, an access control system and an alarm receiving centre.

**Streszczenie.** System alarmowy jest coraz częściej stosowany w budynkach przemysłowych, handlowych czy mieszkalnych. Ponieważ rośnie zapotrzebowanie na kilka rodzajów systemów bezpieczeństwa, odpowiednim rozwiązaniem jest ich integracja, a tym samym przyspieszenie i usprawnienie komunikacji pomiędzy poszczególnymi systemami w celu zminimalizowania ryzyka zagrożeń. Do najczęściej spotykanych systemów bezpieczeństwa nadających się do integracji z systemem alarmowym należą: system wykrywania i sygnalizacji pożaru, system kamer, system kontroli dostępu oraz centrala alarmowa. (**Integracja systemów alarmowych**)

**Keywords:** security system, integration, security

**Słowa kluczowe:** system bezpieczeństwa, integracja, bezpieczeństwo

## Introduction

In addition to the basic needs necessary for life, the human population also needs a sense of security. Historical development and population growth made it evident that people themselves could not provide a sense of security for their lives. Therefore, groups of people who provided help and support gradually began to form. They created and improved this need themselves.

These facts are tied to prehistoric times with a continuous continuation to the present modern society. The emergence of new forms of transport or the increase in the share of technologies also brought greater and broader possibilities for defence and protection.

Security nowadays is a highly resolved situation that can be understood from different points of view. One of the aspects is the protection of people's lives and their property. The article deals in the first chapter with a general description of the alarm security system. The next chapter describes the already specifically integrated alarm security system and individual security systems suitable for integration with the alarm security system. Specifically, it concerns a fire detection and fire alarm system, a camera system, an access control system and an alarm receiving centre. The subchapters describe individual systems' operating principles, system functions, and use.

## 1. The alarm security system

The Intruder and Hold-up Alarm System (I&HAS) has several main tasks. Among the most important are the protection of the health and lives of people and the protection of animals and property.

I&HAS is divided into Intruder Alarm System (IAS) and Hold-up Alarm System (HAS). I&HAS is primarily used to secure residential, commercial and municipal buildings. Residential buildings concern the part of family houses, apartments, blocks of flats, apartment complexes and other buildings intended for human habitation. Commercial objects concern the part of industrial buildings, office buildings, shopping centres, restaurants and bars, and so on. The security of municipal facilities is the security of municipal or municipal offices and institutions, schools, hospitals, social facilities and other facilities.

System modes include alarm, non-alarm, programming, service, and technician modes. Each detector is assigned to zones in the control panel. The individual zones are immediate zone, delayed zone, conditional delayed zone, 24-hour zone, stay zone, departure and arrival time. [1]

## 2. Integrated security system

Integration generally means bringing together into a single whole or system. In this case, it is integrating two or more security systems. Most often, within the integration of I&HAS, integration with fire detection and fire alarm system, with a camera system, with an access control system and with an alarm receiving centre is used.

### 2.1 Fire detection and fire alarm system

A fire detection and fire alarm system (FDAS) is a security system designed to protect people's life, health and property against fire threats. FDAS is used for the early detection and localization of fire and for announcing the alarm. It uses industrial buildings, shopping centres, educational buildings, offices, hospitals, commercial buildings, and residential buildings. FDAS serves to warn people in danger and mitigate the damage from a fire.

FDAS has four essential functions:

- fire detection - by a fire detector or by a person,
- fire signalling - through acoustic or optical signals,
- transfer of information - to ensure an intervention, e.g., to the fire brigade,
- activation of device activity - for sprinklers, fire doors and so on.

FDAS comprises parts: central FDAS, fire detectors, fire alarm device, fire alarm transmission equipment, a device for transmitting reports of malfunctioning states, the control unit of the automatic fire protection device and a power supply device.

Fire detectors are divided according to several factors. The main factor of fire detectors is the physical quantity. According to this factor, detectors are divided into:

- smoke detectors (ionization and optical),
- flame detectors (infrared, ultrasonic and their combination),
- temperature detectors (point and linear),
- gas detectors,
- suction detectors,
- multisensory detectors,
- carbon monoxide fire detectors,
- special detectors,
- interactive alarms.

Another necessary part of the FDAS is using of the fire protection control panel and the fire protection key safe.

The fire protection control panel is a supplementary device of the FDAS. At the same time, the systems are connected via a remote transmission device to the fire

protection units. It enables the essential operation of the electrical fire alarm control panel and indicates its most important states. The fire protection control panel indicates the operational states of the FDAS device in a unified form and enables the fire and rescue service to operate the device ergonomically and uniformly in the event of an alarm and during tests. Indication and functional elements are located on the front panel, divided into individual fields. Its primary functions include turning off the acoustic signal when reporting the "Fire" status, resetting the functions of the FDAS control panel when reporting the "Fire" status, disconnecting and connecting devices for remote transmission, testing the function of the device for remote transmission before its activation and start-up, signalling other states of fire safety equipment, switching off the controlled devices during their revisions and tests.

Another necessary part of the FDAS is the use of fire protection. The fire protection key safely stores and protects the building key in an accessible place. The key is stored and electrically controlled under two doors. When a fire alarm is declared in a closed building, the FDAS control panel releases the outer door of the fire protection key safely for firefighters. The opening of the outer door is monitored in I&HAS. The internal door is opened by the firefighters, based on the documentation of fighting the fire with a master key, and thus access to the building key is enabled. The safe is secured against unauthorized intrusion by connecting to the I&HAS or FDAS system.

The advantage of integrating FDAS and I&HAS been more accessible communication and the possibility to activate fire detectors through a detector designed as a PIR (Passive Infra-red) with a camera. [2]



Fig. 1 – Fire detection and fire alarm system [3]

## 2.2 Camera system

Today, security cameras are used to monitor various objects and land, secure banks, museums, galleries, gas stations, parking lots, airports, and family homes, and are also used in other security applications. The camera system (CCTV) monitors selected areas through cameras. The image obtained by individual cameras is further processed and distributed to other devices that monitor, evaluate and archive image information.

Currently, analogue and digital camera systems are used. NTSC and PAL standards are most commonly used for analogue videos. The transmission channels of an analogue camera system include:

- unbalanced transmission,
- symmetrical transmission,
- optical cable transmission,
- wireless transmission,
- infrared transmission,
- transmission over telephone lines.

Recordings are made from the digital camera system: using PCI add-on cards, a digital video recorder with magnetic recording, and a digital recording device.

Essential camera functions include resolution, angle of view, night vision, construction, additional systems, recorder and photo. The most basic division of cameras is into IP cameras and analogue cameras. With camera systems, following and complying with legislative requirements is essential.

When integrating a camera system with the I&HAS, the advantage is that the camera is automatically directed to the given location and can immediately display the offender on the recording device when an offender is detected. This principle can also work in the opposite order, where the camera records the offender, and the detector specified in the I&HAS triggers the alarm. [4]



Fig. 2 - Camera system [5]

## 2.3 Access control system

Determining who and when will have access to the protected area is simple and easy to change, thanks to a computer. It is a computer-controlled set of elements controlling access to a specific space, who gets where and when. Entry is permitted only to authorized persons at certain, pre-defined time intervals.

An access control system (ACS) is a programmable control panel that allows or denies entry based on a person's identification. The system can record and provide information on using cards and codes, offer the operator overviews of events in the system or generate reports from databases.



Fig. 3 - Access control system [7]

To enter the building or room, a request for a password, identification number, identification cards, chips and a biometric element (fingerprint, iris, face scan and so on) is used. The more requirements there are for entering the building or rooms, the higher the level of security. ACS consists of 3 basic modules: database server, communication server and user interface. These three software modules can work on a single computer or on different computers, which is more convenient as it will increase the performance and flexibility of the system. ACS is mainly used with the attendance system, the system for

dispensing work aids and the system for dispensing food. Cards with barcodes and magnetic and chip cards are used for regime measures.

FDAS is used to open escape exits and open escape routes automatically. As part of the integration, this system is suitable for controlling the entry of people and means of transport into the building and creating regime measures. The camera system controls people's movement in a specific space and the given person's activity. [6]

#### 2.4 Alarm receiving centre

An alarm receiving centre (ARC) is designed to process messages from central alarm security systems, electrical fire alarm systems and possibly other devices and, according to their meaning, perform the necessary action to protect people, animals and property. The core of the entire system is a computer with an installed operating system, where several monitors are connected and important messages are displayed and confirmed on the primary monitor.

The main task of the system is to ensure the highest possible automation and reliability of the processing of security messages, a clear display of alarm messages, including a situational display of a threatened location, confirmation of their receipt by the operator and subsequent manual processing, the division of incoming messages into important and unimportant ones, the organization of emergency response unit events, including the provision of sufficient space information for their activity and archiving of events.

The ARC process is divided into five steps:

- first step – the PZTS control panel sends a signal and information about the object being attacked,
- second step - (if it is not a false alarm) the ARC operator, after receiving information from the guarded object, sends an emergency unit to the object from which the message came,
- third step – the intervention unit performs the intervention on the spot
- fourth step – the intervention unit sends feedback to the ARC operator about the state of the object and its surroundings,
- fifth step – the ARC operator informs the client, or the IZS component, about the event and the status of the guarded object.

The signal is sent to the ARC through a unified telephone network, a digital network of integrated services, radio transmission on dedicated frequencies, and network transmission via GSM. The transmission of the network via GSM can be carried out using the voice band via SMS or GPRS. The essential services of ARC include monitoring, intervention, patrol system (preventive inspection), additional services, service and security. [8]



Fig. 4 - Alarm receiving centre [9]

#### Conclusion

Security is a concept that is found in practically every branch of society. It started to form when the society was founded and is gradually being transformed until the present day. Human built security for himself or others. As society changed and the population increased, people could not create maximum security for themselves or others.

The concept of security and security risk is very used and popular terms these days. We can watch them mainly on television, the Internet, radio, and almost everywhere. Over time, the complexity and security requirements also increase. People feel good when they know they are safe.

The article dealt with security systems and their integration. In the first chapter, the alarm security system was described in general. The following chapter described the integration of the alarm security system, where the most commonly used security systems suitable for integration with the alarm security system were described individually. Specifically, it was a fire detection and fire alarm system, a camera system, an access control system and an alarm receiving centre. The individual security systems' operation, functions, and use principles were described. The disadvantage of integration is that if the security systems were integrated into a single control panel, there would be a risk of frequent outages, slow or ineffective communication, false alarms and overall system load. Therefore, each security system should have its control panel. In the future, it is advisable to add more intelligent technologies to security systems to improve the quality and efficiency of the overall integration of other security systems.

#### Acknowledgments

*This research was based on the support of the Internal Grant Agency of Tomas Bata University in Zlín, IGA/FAI/2023/001 and The Department of Security Engineering, Faculty of Applied Informatics.*

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#### REFERENCES

- [1] ČSN EN 50131-1 ED.2. Intruder and Hold-up Alarm System – Part 1: Systems requirements: Alarm systems. 2<sup>nd</sup> edition. 2007 (Czech technical standard)
- [2] Xin J, Huang C: Fire risk analysis of residential buildings based on scenario clusters and its application in fire risk management. Fire Safety Journal. 2013. 62, 72–78. Available from: <https://doi.org/10.1016/j.firesaf.2013.09.022>
- [3] FDAS Fire Detection & Alarm System: Sunway [online]. Available from: <https://www.sunway.net/en/col.jsp?id=164> [cit.2023-01-29]
- [4] ČSN EN 62676-1-2. Video surveillance systems for use in security applications – Part1-2: System requirements – Performance requirements for video transmission: Alarm systems. 2014 (Czech technical standard)
- [5] The Best Remote Security Camera Without a Subscription: CCTV Security pros [online]. Available from: <https://www.cctvsecuritypros.com/blog/the-best-remote-security-camera-without-a-subscription/> [cit. 2023-02-02]
- [6] ČSN EN 60839-11-1. Alarm and electronic security systems – Part 11-1: Electronic access control systems – System and component requirements. 2014 (Czech technical standard)
- [7] Electronic Access Control Standards: Solutions [online]. Available from: <https://www.ul.com/resources/electronic-access-control-standards> [cit. 2023-02-12]
- [8] ČSN EN 50518. Alarm receiving centre. 2020 (Czech technical standard)
- [9] Alarm Receiving Centres. What are they? Unique Fire and Security [online]. Available from: <https://uniquefireandsecurity.co.uk/monitored-burglar-alarms/> [cit. 2023-02-18]
- [10] Zain Din, A., Januszewski, K. The implementation of a virtual platform, built on the basis of a hardware cloud solution. Przegląd Elektrotechniczny. Volume 12/2021. 2021