THE ULTIMATE GUIDE TO BUILDING AUTOMATION IN DATA CENTRES

Honeywell

INTRODUCTION

The data centre market is expanding rapidly as both hyperscalers and colocation centres seek to meet the demand for cloud computing and the rise in Artificial Intelligence (AI) applications. Data centres are business-critical facilities that face severe financial consequences for any disruptions to operations. Furthermore, data centres consume significant amounts of energy, making operational efficiency and sustainability a vital issue for the industry. Security, both physical and cyber, is another focus area, as data protection requires strict intruder prevention and access control measures.

Data centres are complex environments with high expectations of facility performance for optimal operation. For example, precise environment (temperature, humidity, indoor air quality) controls for cooling, strict access control for data protection, and monitoring for the earliest risk factors leading to fire. Specific fire threats, such as lithium-ion (li-ion) batteries, require advanced detection to prevent thermal runaway scenarios with huge liabilities. A variety of advanced fire detection solutions must cope with these challenges and provide reliable early warning of a fire, without generating costly false alarms.

The building management system (BMS), sometimes referred to as a building automation system (BAS), plays an essential role in managing efficient operations, especially when it comes to maintaining resiliency and reducing energy consumption. This is a critical issue given the large amount of heat generated by servers. Building management systems can also automate standard functions to reduce the reliance on skilled resources that are becoming scarce in the industry.

Physical security solutions for data centres include video capture, video analytics and access control. These systems must provide an audit trail of who has accessed which area down to the cabinet level. Access control systems should be easily updated to allow authorised personnel to perform daily tasks without creating security risks.

Cybersecurity solutions must protect both operational technology (OT) and information technology (IT). To comply with the new legal infrastructure set out in NIS2, Data centres must deploy industry-leading systems to safeguard the business-critical data they store for clients.

At the same time, operational systems must be protected from outside influence to ensure that the data centre retains the highest level of resilience. Two-factor authorisation is common in the industry to satisfy data protection requirements.

Honeywell Building Automation (BA) offers an integrated approach to the vital low-voltage subsystems of BMS, fire safety and security. This allows data centre companies to take advantage of leading technologies in each field as well as the benefits achievable through an integrated solution. Additionally, Honeywell technologies can integrate with third-party solutions to give data centres maximum flexibility.

DATA CENTRE INDUSTRY TRENDS IN EUROPE

The data centre market is growing exponentially in Europe as hyperscalers and colocation data centres expand their footprint in the region. A Morgan Stanley podcast[1] highlights three reasons for this rapid growth:

- Demand for cloud computing and digitalisation
- The rise in AI with its requirement for training models in a single data centre
- Legislation for data sovereignty and nearshoring of European data

According to a report from the commercial real estate investment firm CBRE, the European data centre market will expand by 937MW of new supply in 2025. This will be a new record and will eclipse the 2024 figure of 655MW. More than half this capacity will be delivered in the primary markets of Frankfurt, London, Amsterdam, Paris, and Dublin.

Five out of ten of the secondary markets like Milan and Madrid are expected to achieve double-digit supply growth[2]. Micro and small data centres are growing in popularity, as well as modular designs for electrical infrastructure, due to their scalability.

Resilience and stability are critical success factors in the data centre industry. Businesses rely on continuous access to their data and services, which is why system downtime can result in substantial liability. While actual downtime data and financial impacts are rarely reported publicly, some insights can be gained from research reports, such as the Uptime Institute's annual outage analysis[3]. Their review for 2024 indicates that more than half the respondents shared that their most recent significant, serious, or severe outage cost more than $100,000 (€92,400) and 16% experienced costs of more than $1 million (€924,150).

The Uptime Institute reports that there are, on average, 10-20 high-profile IT outages or data centre events globally per year that cause substantial financial loss, business interruption, reputational loss, and, in some cases, loss of life. One of these events, reported in Forbes, was an interruption to Meta on 5 March 2024 . The article states that 76% of Facebook users reported issues with logging in and 61% of Instagram users reported issues with the app during the incident. The severity of these lapses highlights the need for data centres to implement effective, redundant, and proven building automation system architecture.

Another key trend in the data centre industry is the drive towards Net Zero through sustainability initiatives. An International Energy Agency (IEA) report[5] stated:

> **"Data centres are significant drivers of growth in electricity demand in many regions. After globally consuming an estimated 460 terawatt-hours (TWh) in 2022, data centres' total electricity consumption could reach more than 1,000 TWh in 2026. This demand is roughly equivalent to the electricity consumption of Japan."**

The European Commission has set a target of achieving carbon neutrality by 2050, and the data centre industry has committed to achieving this goal by 2030[6]. As a result, data centre companies are exploring renewable energy resources, including the use of battery energy storage systems (BESS) powered by li-ion batteries as a supplement, or replacement for backup diesel generators.

DATA CENTRE INDUSTRY CHALLENGES

> **Data centres are complex environments with several operational areas that overlap and interact with each other. AI applications require more computing power and higher rack densities. At the same time, regulators are tightening emission standards, causing data centres to explore sustainable energy sources and manage their power consumption more efficiently.**

A lack of standardised solutions across all the data centres in a portfolio also raises the total cost of ownership. Value engineering initiatives at the project level do not maximise portfolio-wide benefits. For example, using the lowest-cost devices in each region leads to separate stock holding and the need for training and support across a wide range of products. Several entities are involved in the design and build of a new data centre, including building and facilities owners, general contractors, MEP companies (mechanical, electrical, and plumbing), A&E (architecture and engineering), and consultants. A fragmented approach to technology can lead to inefficient solutions that do not work together to achieve the desired outcomes.

UPTIME AND RESILIENCY CHALLENGES

Uptime and resilience are critical performance indicators for data centres. The Uptime Institute classifies this performance into tiers, with Tier 1 offering 99.671% uptime and Tier 4 offering 99.995%[7] uptime . The Tier 4 standard equates to 26.3 minutes of downtime per year and can only be achieved through redundant systems that take over from each other automatically should any single piece of equipment fail. Building management systems that meet Tier 4 criteria include redundant architecture, automation, and proven technology for both hardware and software solutions. They must provide continuous power and cooling to data centres through redundant sources that are independent of each other.

Fire safety systems are also critical for preventing data centre downtime. However, there are challenges to fire detection in these facilities. The large building footprint of data centres means that physical fire detectors are spread out over long distances. The forced airflow from the HVAC system also creates a high air change environment, which is challenging for fire detection as smoke gets diluted in the moving air. To overcome these challenges, data centres must take advantage of fire detection technologies that can pick up trace levels of smoke to enable early warning of a fire event. They must also implement effective systems for testing smoke detectors for compliance, especially in areas that are difficult to access.

Automating building operations helps reduce human errors that can impact data centre uptime and resilience. Measuring key parameters and using data analytics and AI can help data centres manage equipment health and predict failure, including critical equipment like battery backups. Honeywell has an integrated approach to uptime and resilience, combining fire safety, building automation and equipment health monitoring.

OPERATIONAL EFFICIENCY AND SUSTAINABILITY CHALLENGES

Improving operational efficiency is the key driver for data centres to overcome their sustainability challenges. Data centres are a significant consumer of energy. Some estimates indicate that the industry will consume 7% of global energy demand by 2030[8]. As a result, sustainable growth is a significant factor limiting the scaling of data centres worldwide.

In addition, regulators are raising the profile of data centre emissions with the introduction of measures like the Energy Efficiency Directive (EED) scope 2. These initiatives require data centres to report on energy and utility usage. Data centres built for AI applications have higher demands for computing power and generate even more heat. Racks are packed into the space more densely, requiring new technologies like liquid cooling. Regulations around these new technologies are still developing, which could add more complexity to fire detection and energy management systems.

Meeting these challenges will require building automation systems that monitor key parameters in real-time and control energy efficiency and heat recovery automatically. Honeywell offers expertise in building management systems and electrical power monitoring and management systems (EPMS) that optimise assets for the best efficiency. This integrated approach allows data centres to reduce the Power Usage Efficiency (PUE) as well as reuse waste heat to defray operating costs and minimise the carbon footprint. Using analytics tools and building management systems, Honeywell can reduce reliance on skilled resources that are not widely available. As an added benefit, Honeywell BMS systems integrate seamlessly with asset vendor systems to maximise the return on existing investments.

The sustainability drive is also introducing new technologies to data centres and new fire risks. Li-ion batteries offer an extended lifespan, and lower weight compared to VLRA alternatives, giving them an advantage in terms of carbon emissions[9]. However, li-ion batteries generate electrolyte vapours before a complete failure, which are very difficult to detect. The threat of thermal runaway and the negative publicity surrounding li-ion fires has led some data centres to move away from this technology and turning to new and improved VRLA batteries. This constant change in technology makes it challenging to manage fire safety systems and energy efficiency. Advanced fire detection solutions from Honeywell can help data centres to overcome these complex challenges.

SAFETY AND SECURITY CHALLENGES

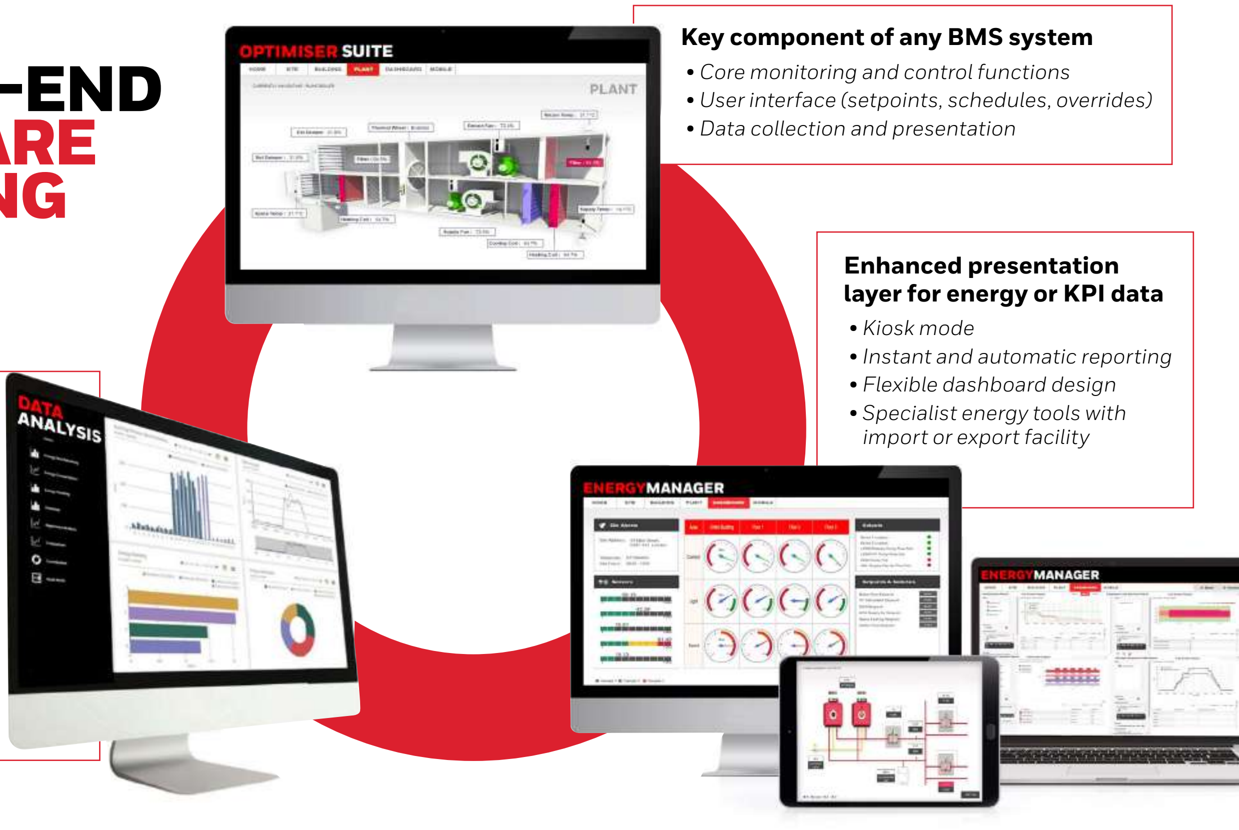
Data centres have both physical and cybersecurity challenges due to the sensitive nature of privacy and strict regulations surrounding data protection. Physical threats include sabotage or the bypassing of cybersecurity measures through direct access to servers on site. These threats are posed by visitors and employees who may be compromised. Data centres must be able to quickly update credentials and track movements through restricted areas. Even remotely operated equipment, like drones, can be used to threaten the security of a data centre.

Cybersecurity threats for data centres include both IT and OT. Hostile entities may seek to gain access to data through ransomware, hacking, or phishing activities aimed at employees. Operational systems are also subject to attack as a disruption to the power supply, HVAC, or liquid cooling systems can take an entire data centre offline.

To counter these threats, data centres must deploy comprehensive safety and security systems that include video capture, video analytics, digital video management (DVM), and access control. Both IT and OT cybersecurity measures must also be activated. Yet, all these systems should not hamper other functions like fire safety testing or building automation. Each data centre is a unique environment with its own risks and challenges. Only a holistic approach that takes these challenges into account can be relied upon to meet the needs of each data centre for fire and life safety, building automation, and security.

Honeywell offers an integrated security approach that combines intrusion, video and access systems. Enhanced security is achieved through double verification, including biometrics, while video coverage includes 360-degree protection from drone threats. Security systems also play an active role in monitoring incidents on camera and isolating areas of the data centre where an incident has occurred.

END-TO-END SOFTWARE OFFERING



Key component of any BMS system

- *Core monitoring and control functions*
- *User interface (setpoints, schedules, overrides)*
- *Data collection and presentation*

Enhanced presentation layer for energy or KPI data

- *Kiosk mode*
- *Instant and automatic reporting*
- *Flexible dashboard design*
- *Specialist energy tools with import or export facility*

Integrated software to efficiently analyse data

- *Report on areas of non-conformance or risk*
- *Identify optimisation opportunities*
- *Present data in a variety of formats*

Like an engineer – 24/7 – only more efficient

INNOVATIVE TECHNOLOGIES FOR THE DATA CENTRE INDUSTRY

The pace of data centre expansion is so rapid and the demand so high that modular and scalable solutions are an essential means to achieving these goals. Honeywell is on-boarded in the very early project phases between RIBA (Royal Institute of British Architects) two and three and before large equipment for the data centre is specified. This helps to form a standardised approach that allows for rapid deployment of solutions. It also eases the training burden for staff and mitigates the skills shortage in the industry. Both our in-house (Honeywell Building Solutions) direct deployment teams, as well as our long-term relationships with global data centre system integrators (Honeywell Channel Partners), ensure that competent people are available to execute projects and support long-term data centre operations.

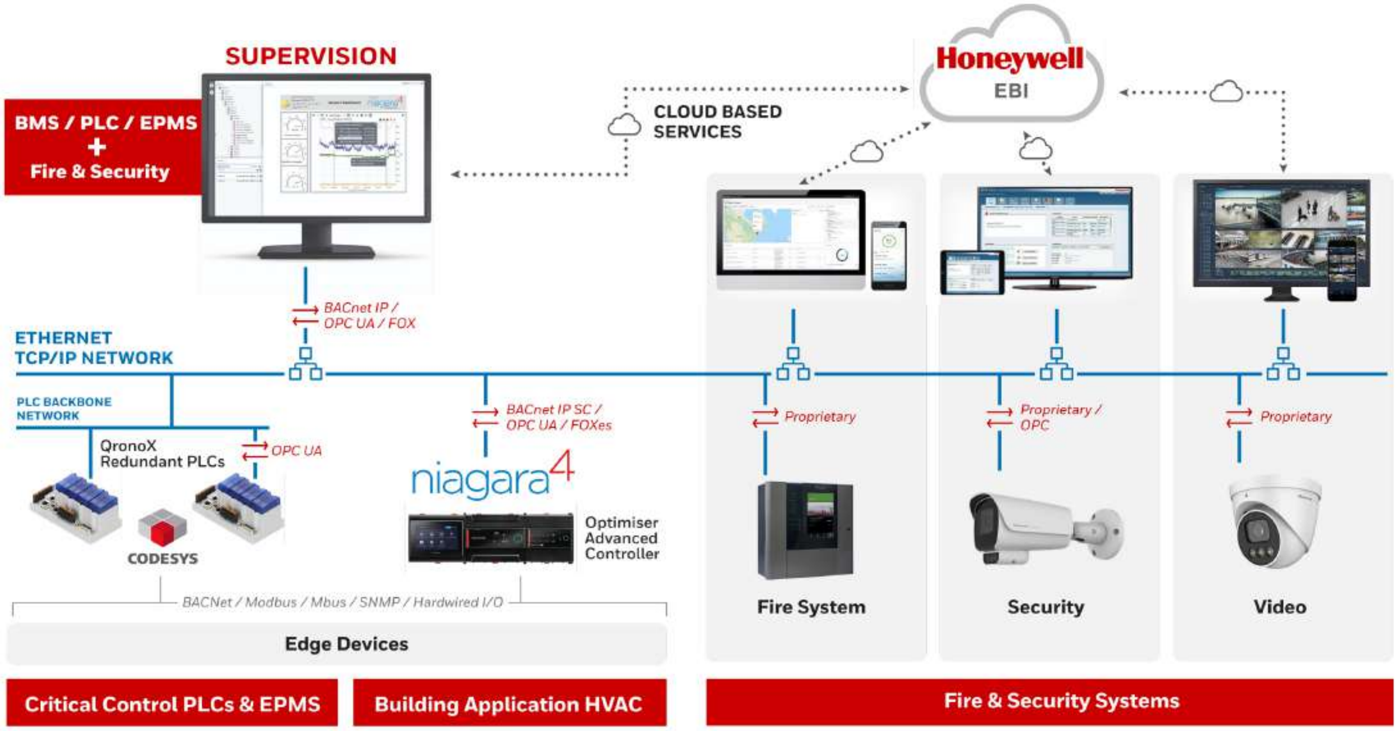
Honeywell has decades of experience and a global presence in the data centre industry. Nevertheless, our innovative technologies integrate with third-party hardware and software, allowing data centres the flexibility to integrate their existing investments with a holistic solution.

INNOVATIVE BMS TECHNOLOGIES

A Building Management System (BMS) acts as the central "brain" of the data centre for fire safety, building automation, and security. Several BMS options are available for the data centre industry, including Honeywell Niagara 4, and Honeywell Optimiser Suite. Using remote systems built on this infrastructure, data centre companies can monitor the performance of multiple sites, compare performance, and troubleshoot problems. This functionality enables data centre operators to report key performance indicators (KPIs), like temperature, to their clients in a cybersecure environment.

An Electrical Power Management System (EPMS) provides visualisation and supervision of diverse energy sources. The system identifies energy and power anomalies, potential cost savings and energy-saving opportunities. Honeywell's EPMS works with a power quality metre that captures standard metrics, such as voltage, current, power, energy, and power factor as well as advanced key metrics, like harmonics, K-factor, crest factor, and phase angles. It can also monitor high-density data (milliseconds) for polling by the EPMS.

FACILITY MANAGEMENT SYSTEM (FMS) OVERVIEW



INNOVATIVE FIRE SAFETY TECHNOLOGIES

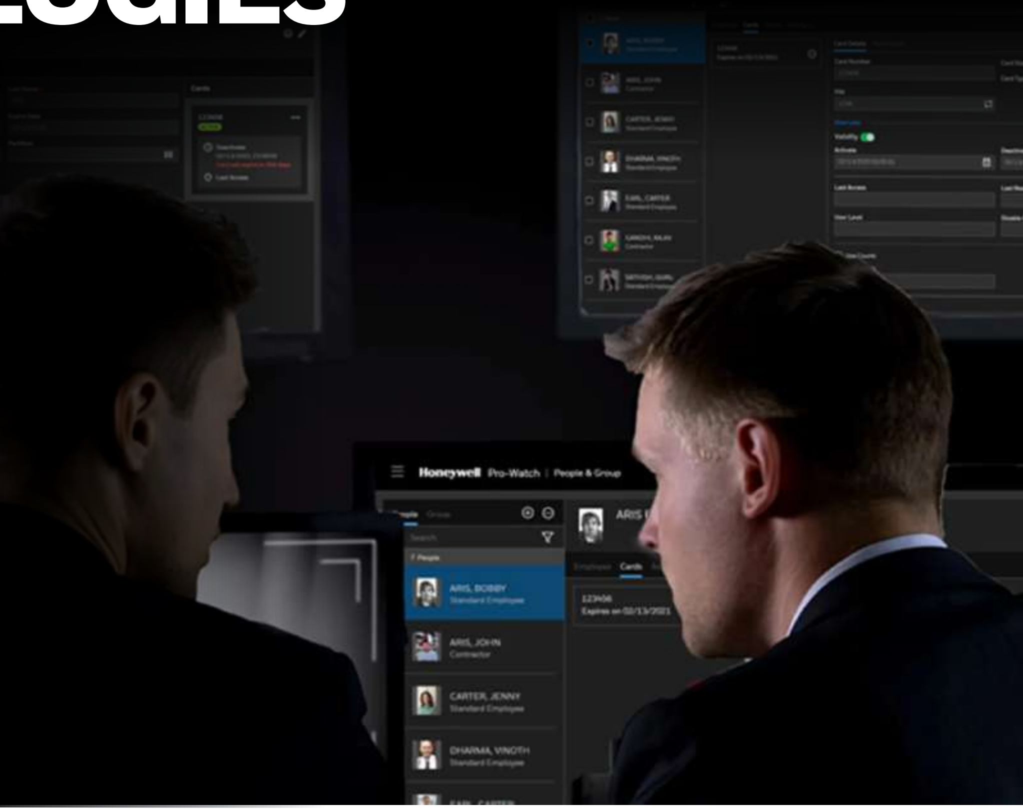
VESDA, the leading aspirating smoke detector (ASD), is designed for EN54-20 class A applications and capable of numerous sampling points for flexible and sensitive smoke detection. Typically placed in front of HVAC return vents and near server racks, VESDA detects smoke at its source, allowing for timely alerts as data centre ventilation systems evolve.

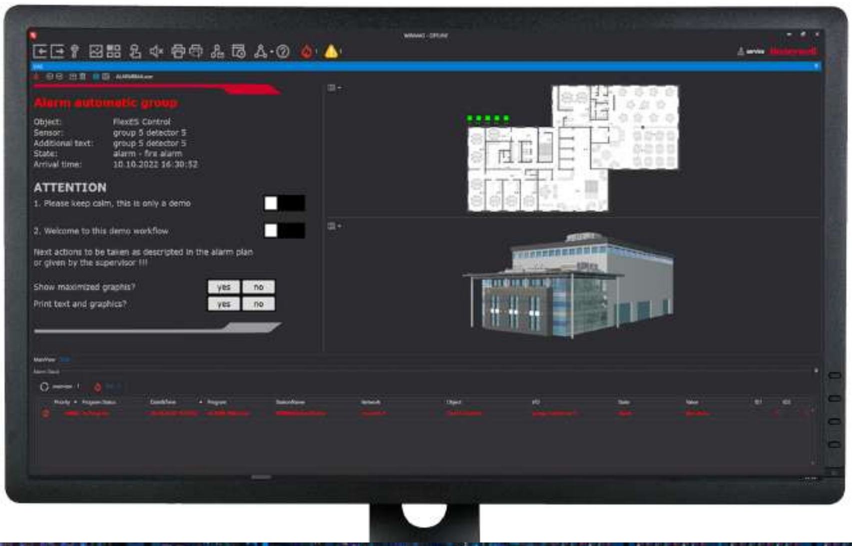
Li-ion Tamer is an essential technology for identifying off-gas from lithium-ion batteries, detecting electrolyte solvent vapours before they lead to thermal runaway. This early detection provides operators with valuable response time to shut off power, prevent thermal runaway, and replace faulty batteries, thereby safeguarding against potential fires in facilities using li-ion technology.

Self-Test heat and smoke detectors are the optimal choice for access-controlled or office areas where maintenance can disrupt work. Unlike traditional tests that require engineers to access each detector individually with heat and smoke poles, Self-Test detectors automatically generate the required smoke and heat for testing, allowing simultaneous testing of multiple loops and panels. This process keeps the fire safety system active, ensuring alarms will trigger if a real fire occurs during testing. Additionally, Honeywell fire panels and Connected Life Safety Services (**CLSS**) support scalable solutions for data centres of all sizes. The CLSS app offers visibility and records activities like compliance testing and maintenance. Engineers can log visual inspections on-the-go, confirming device labels easily. When integrated with VESDAnet, engineers gain real-time access to information about aspirating detectors and the overall fire safety system, all managed on the Honeywell Forge platform for comprehensive data centre automation.

INNOVATIVE SECURITY TECHNOLOGIES

Pro-Watch Integrated Security Suite meets the demands of the data centre industry in a holistic approach covering access, intrusion management, and video surveillance. The system centralises real-time data in a cloud-connected ecosystem. Pro-Watch Intelligence Command is a web-based, thin-client interface that provides total situational awareness and command of the security system. A mobile application enables users to access the suite remotely.





Alarm automatic group

Object: FlexES Control
Sensor: group 5 detector 5
Additional text: group 5 detector 5
State: alarm - fire alarm
Arrival time: 10.10.2022 16:30:52

ATTENTION

1. Please keep calm, this is only a demo

2. Welcome to this demo workflow

Next actions to be taken as described in the alarm plan or given by the supervisor !!!

Show maximized graphis? yes no
Print text and graphics? yes no

WINMAG alarm management system integrates with sub-systems to give excellent operability, intuitive control, and sequence automation. The system enables users to visualise and evaluate emergency situations for evaluation in 3D. WINMAG can control access and escape routes, while providing information on the status of equipment like elevators during evacuation.

INNOVATIVE ACCESS CONTROL TECHNOLOGIES

LenelS2's OnGuard Cloud solution is essential for securing data centres, particularly those with colocation, where foot traffic from employees, visitors, and contractors is substantial. It ensures that all individuals are properly credentialed and limited to specific areas relevant to their roles, enhancing overall security. With the Magic Monitor® unified client, administrators gain a comprehensive view of their physical security infrastructure. The system tracks data centre assets using existing barcode infrastructure, eliminating the need for additional hardware or software. Notifications alert system administrators when assets are not returned, and access levels for non-compliant employees can be automatically adjusted. LenelS2's OpenAccess Alliance Program (OAAP) allows seamless integrations with various third-party solutions, including video management and identity management systems. The offering enables end-to-end encryption and supports multiple authentication methods, such as smart credentials, biometrics, and multi-factor authentication. With cloud-based capabilities, data centres can efficiently manage and monitor access control and physical security activities, benefitting from consistent software updates that align with industry standards.

IQ MultiAccess offers the control of different locations via one system. These locations could be different sites, different companies within a building, or different companies that use a common access control system. Each company can use common doors without seeing the data of other companies. A hierarchical use organisation guarantees data protection while maintaining smooth operations.

TABLE OF HONEYWELL PRODUCTS FOR THE DATA CENTRE INDUSTRY

BUILDING MANAGEMENT SYSTEMS	DESCRIPTION
SBC Controllers and Software	Controllers for monitoring and automated control of building management systems, including analysis of energy consumption and optimisation of operations.
Honeywell Optimiser Suite	Comprehensive building management system including controllers and software suites for monitoring and optimising operational performance.
EBI R500 Platform	Honeywell Enterprise Building Integrator designed to connect fire safety, building management and security into a single platform providing real-time data for data centres.

FIRE SAFETY COMPONENT	DESCRIPTION
Aspirating smoke detection	Aspirating smoke detection technologies with continuous air sampling provide the earliest possible warning of an impending fire hazard.
Self-Test	Automated functional test to improve maintenance and testing, whilst maintaining full compliance.
Fire alarm control panel (FACP)	A system that activates automatic fire suppression systems, such as NOTIFIER, Esser, and Gent.
Connected Life Safety Services (CLSS)	A secure cloud-based system to monitor system health, maintenance, and alarms from anywhere in the world with digital reporting functionality.

SECURITY COMPONENT	DESCRIPTION
ProWatch Integrated Security Suite	An integrated suite of modules including video and access control. Intelligent Command interface gives complete situational awareness and command of the security system.
LenelS2 OnGuard	LenelS2 OnGuard security solution ensures that everyone who works at and visits a data centre is appropriately credentialed and can seamlessly access only the specific areas relevant to them. LenelS2's Magic Monitor® unified client, provides data centre administrators with a holistic view of their infrastructure.
WINMAG	WINMAG alarm management system integrates with sub-systems to give excellent operability, intuitive control, and sequence automation.
IQMultiaccess	IQ MultiAccess offers the control of different locations via one system.

CONCLUSION

> **The data centre market is expanding rapidly due to cloud computing and AI requirements, creating opportunities for both hyperscalers and colocation facilities.**

The industry demands constant availability and resiliency, making it essential to protect data centre operations with advanced integrated solutions. Operational efficiency is paramount, due to the high energy consumption of data centres and the drive towards sustainability. Maintaining high levels of security is essential for data centres to meet the data protection needs of their clients.

Honeywell provides proven and advanced fire and life safety technologies, building management systems, and security for the data centre industry. These systems work together seamlessly to meet the challenges of the data centre industry. Using an integrated Honeywell offering, data centres can achieve high levels of operational efficiency, sustainability and improved fire and life safety.

LEARN MORE ABOUT OUR SYSTEM ARCHITECTURE FOR THE DATA CENTRE INDUSTRY HERE.

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