

A study on the design method of a wholeness management system based on integrated management of data centers

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Abstract- In recent years, with the rapid development of cloud computing and IoT, the demand for big data has increased and the need for large data center and enterprise data center has been actively promoted. (1,3)

In this paper, a system design method that integrates and manages various information systems in the data centers of enterprise units is dealt with.

Since the production facilities of medium-scale units are managed by various detention facilities and control devices, an integrated monitoring system should be established to manage them collectively. (2)

Therefore, the paper suggests a standard design for proposing an integrated model face-to-face configuration of various facilities to be managed in enterprise units and an integrated monitoring system for environmental facilities, do.

And we try to evaluate the effectiveness of the system by analyzing the failure information transmission time of the integrated monitoring system.

.Keywords- FMS, Data Center, Integrated Surveillance System

1. Introduction

Today's surveillance systems use a variety of sensors to monitor the environment, production processes, and even the health and mental state of system users. (4,6)

In addition, due to the development of information management and communication technology, the performance and coverage of the surveillance system is greatly expanded and the integration of various information management subsystems can be realized. (7)

The integrated monitoring system enables abnormal situation detection in various fields such as production facilities, production processes, production management and personnel management, which improves correct situation awareness and helps to make appropriate decisions.

The purpose of this paper is to provide standard design methods for the optimal design of the surveillance system for the data center, so that users can refer to it in the establishment of the data center by enterprise unit..

Currently, the market for prisoners' equipment technology such as USN is constantly expanding and introduction of integrated facility management system for production facilities using FMS (Facility Monitoring System) has brought high availability and reliability to high level and prevention against various disasters the possibility is increasing. (2,3)

However, in the realization of the integrated monitoring system based on the data center, a new design method is being proposed by the following factors.

First, it is the physical separation and management of the data center and the factory site.

These factors include the vulnerability of security due to the unattended IT infrastructure, the lack of immediate measures due to physical distance, and the need to manage access.

Second, it is a matter of protection of production equipment resources. There is a

need for a management system for wired and wireless prison networks that can manage the integrated management of increasing facilities and environmental factors (such as temperature / humidity, and leakage). Especially, the protection system is important because it is used in various fields where wired lines are difficult to construct.(1)

Third, it is a real-time notification system for immediate response in the event of a disaster. When a disaster occurs outside the work hours, the response system must be activated immediately, and an ongoing response system should be established.

Fourth is real-time on-site surveillance. Real-time on-site surveillance through CCTV cameras, and real-time identification and management of incident conditions (2).

In order to solve the problems described in the paper, the paper first realizes the standardization of the design and construction to ensure the quality of the integrated monitoring system, establishes the basic data for the requirements of the integrated monitoring system, This paper proposes a method to apply the method to the study.

2. Related research

2.1. Investigation and analysis

FMS is a key element in the establishment of the monitoring system in the data center. The basic elements of the design, which consists of the prisoner unit, supervisory control module, and communication module, should be selected from the situation of the object, selection of the prisoner, and the supporting communication protocol and design scope of each device. (1, 2)

In the research and analysis phase, environmental justice, needs analysis, situation analysis, field survey, and budget analysis are performed. Environmental definitions and requirements are an analysis of the planning required by the target organization, ie, the action plan and the detailed requirements.

First, plan the scope and scale of the design of the system, and compare it with the environment of the currently operating data center, and set the target and reflect it in the design.

It is also an important process to grasp investment budgets along with field research. If the investment budget and the design scale do not match, you will not get the right result. The specific contents of the survey include investigations of vulnerability of the data center by surrounding areas, such as surrounding facilities, access control targets, and location of video surveillance.

In this paper, we investigate the intelligent integrated monitoring system and the integrated management of environmental facilities at the underground railway station constructed with the purpose of the past.

The intelligent comprehensive surveillance system applied to the underground railway station consists of a surveillance camera such as an intelligent network camera, a dome camera, a PTZ (Pan / Tilt / Zoom Camera) camera, and a prison network for measuring soundness, fire and humidity , And documented the "method of constructing the field of intelligent comprehensive monitoring system" for reference in the operation of the underground railway station.

A study on the integrated management of environmental facilities in institutional buildings defines the security system of buildings and describes the entire process from design to construction and integration. (5)

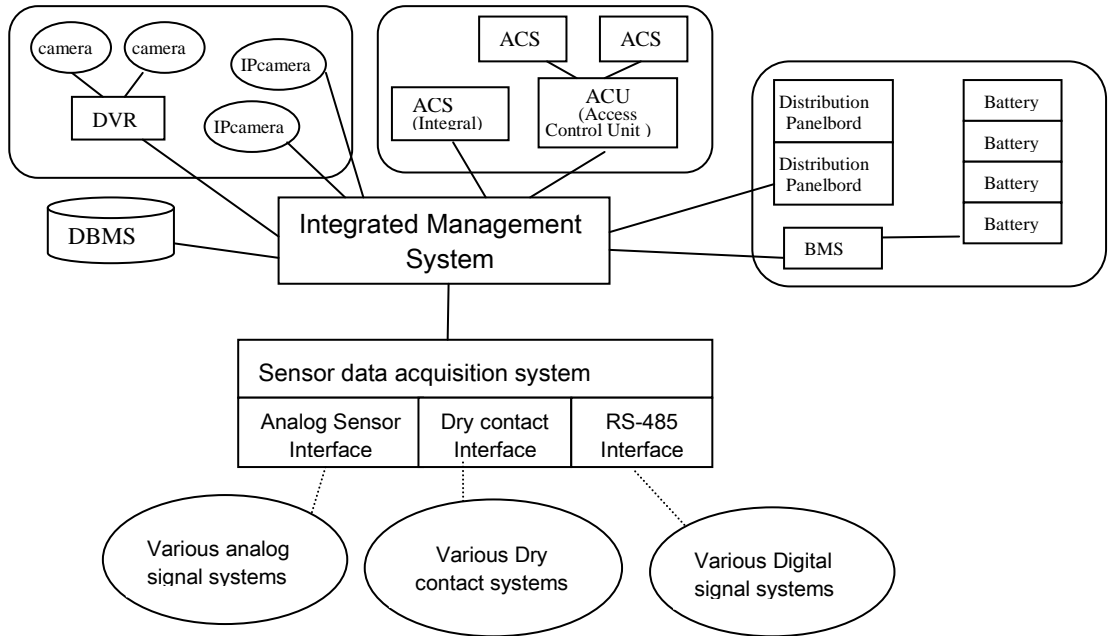


Fig. 1 The configuration of Integrated monitoring system

2.2. Type of accident

For the operation of data center peripherals, the management subjects are classified into major components such as electricity, air conditioning, fire extinguishing, access control, and video surveillance.

Table 1 shows the types of accidents and countermeasures against peripheral equipment in data center management. The data center surveillance system has been established so that the operating agencies are able to detect and prevent risks early, preventing and preventing the spread of major disasters.

Items	Object	Content	Response
Fire-fighting equipment	UPS	The primary power failure	Safe shutdown and protection measures for computational resources during battery powered time with rapid notification and prevention of Secondary accidents
		Inverters Bypass,etc	Fast UPS Inverter Repair, and determine the cause of the bypass
		Overheating	UPS fault and for fire emergency fail-over
	Battery	Battery Overheating	Early detection and response to battery overheating, fire and explosion
	Distribution boards	Overload	Accident prevention through the distributor outlet overload monitoring

Fire-fighting equipment	Constant temperature and humidity chamber	Integration Disorder	Maintenance actions through a notification about a variety of disorders of the constant temperature and humidity chamber (compressor, temperature, humidity, water leakage, etc.)
		Leaks	The prevention of secondary accident about leaks through the leak detector (flooding, electrical short circuit, etc.)
		Operation Status	Wind strength and whether it works
	Air conditioning	Operational status, Leaks	Air conditioning wind or not, Leak Detection
Fire-fighting equipment	Automatic fire extinguishers	Fire	For early fire detection signal and prompt action
		Extinguishing agent release	Secondary measures in accordance with the fire extinguishing agent release signal notification
Access Control	Doors	Open	Machine Room temperature rise in accordance with the doors open
		Invasion	Access control, surveillance history
CCTV	CCTV	Camera	Day/night surveillance entrant
		Surveillance	Facility Status Surveillance

Table. 1 Accident types and the corresponding of the data center monitoring system taxonomy (3)

In the data center, the management subjects are classified into important factors such as electricity, air conditioning, digestion, access control, video surveillance, and based on the contents to be managed, It is a countermeasure against accident occurrence flow type.

By establishing and operating a surveillance system at the data center, the company is able to prevent the spread of disasters and increase the production rate by preventing and preventing risks in advance.

3. Design of data center integrated monitoring system

3.1 Integrated Model Protocol Interface Configuration

Data center surveillance system is a fusion system of data center surveillance system that organically integrates and manages software, DBMS, USN, and Facility Monitoring as one solution based on the unique role of each component.

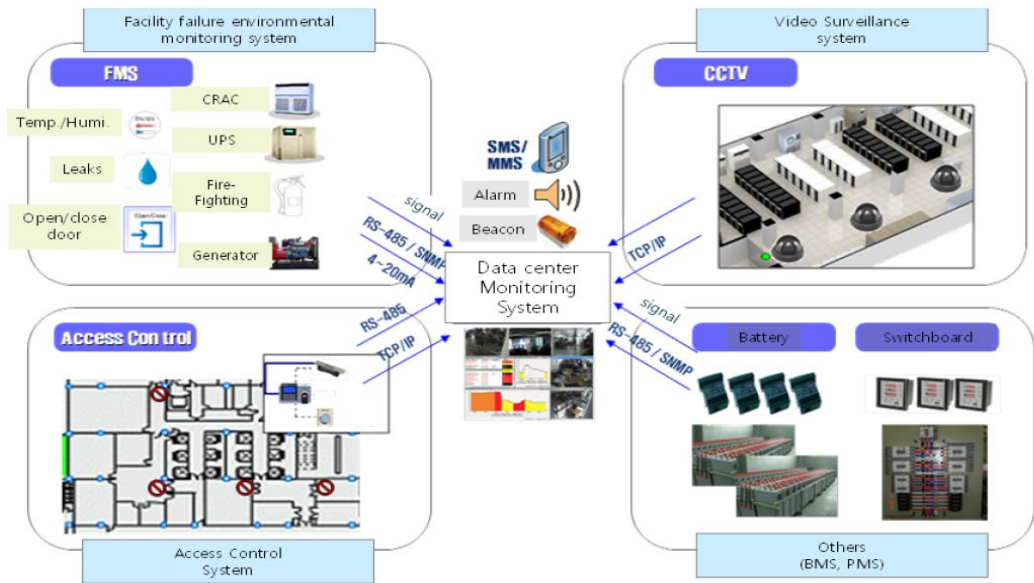


Fig. 2 The combined configuration of protocol among systems

Figure 2 is a diagram that fuses interfaces of various heterogeneous systems from electricity, air conditioning, fire fighting, CCTV, access control to BMS (Battery Management System), and PMS (Power Management System)

In order to integrate various facility systems such as FMS, CCTV, ACS, BMS, and PMS for the data center's integrated monitoring system design, this study consists of five steps.

- 1). Choosing the goal of system construction
- 2). Scope of the system
- 3). Review the status of existing infrastructure
- 4). Inter-system interface design
- 5). Integrated monitoring system model design

Figure 3 shows the procedure diagram for the integrated monitoring system design scenario in the data center. This requires the selection of specific goals and scope based on the procedures of the design scenario (4)

3.2. Model study between systems

In order to integrate the systems, various types of data such as sensor information data, fault signal data, image data, entrance / exit information of access control system, and power information of power monitoring system are integrated into a single database.

It is a design model that interlocks and processes database.

The monitoring application stores the sensor detection location and sensor data measurement results in a database and transmits it to the person in charge via text message or e-mail in realtime.

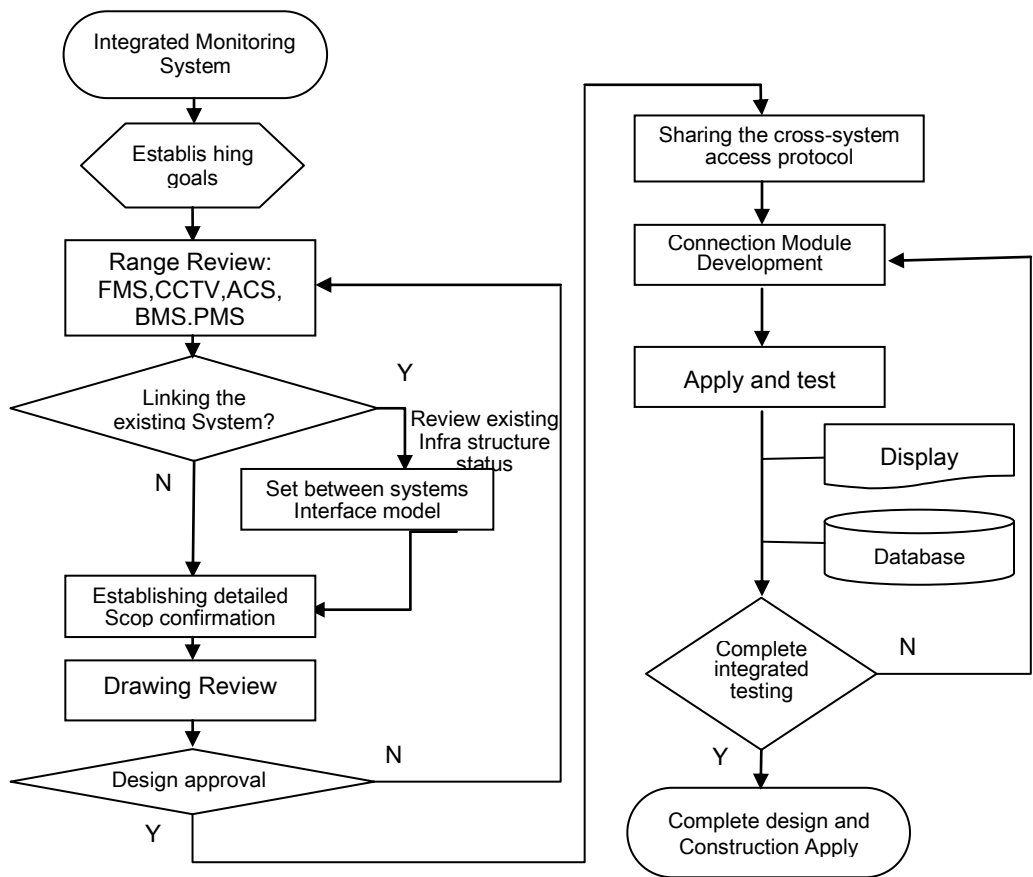


Fig. 3 Design scenarios for integrated monitoring system procedures

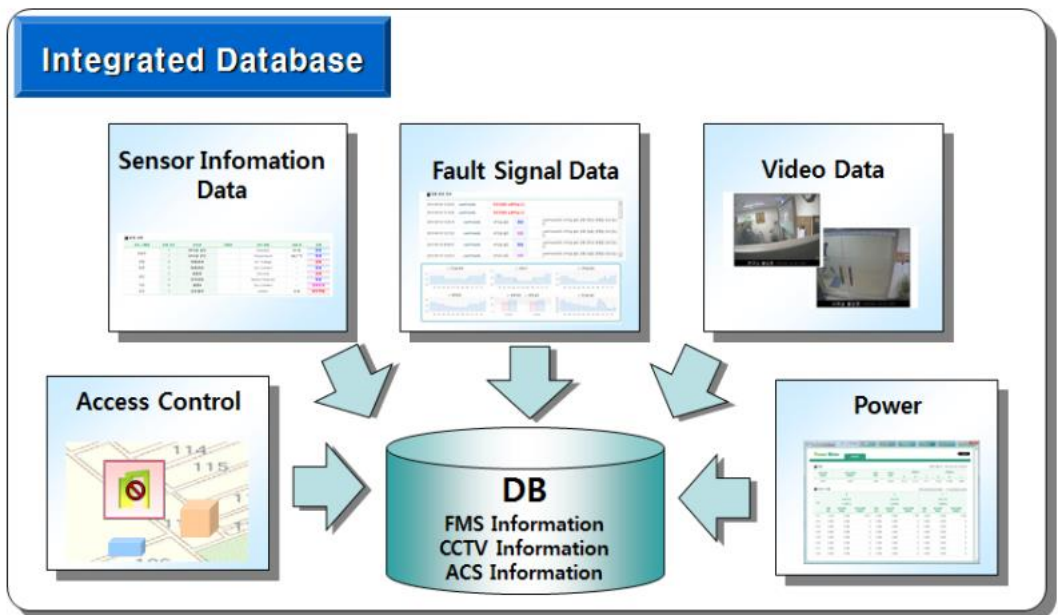


Fig. 4 The Information transactions of DBMS

3.3. Comparison and Scalability

Advantages of data center surveillance system integration include elimination of redundant investments, efficiency of management, and construction of a three-dimensional monitoring system.

In general building management system, there is no maintenance and fault management based on the correlation between facilities. Recently, a study on building facility maintenance and fault management system that can make a comprehensive fault judgment has been going on(4).

However, integrated monitoring of environmental facilities in the data center is still lacking, and system interworking is required for various types of monitoring systems. FMS sensor, access door sensor for access control, and motion sensor in CCTV can interoperate with each other.

In addition, it is possible to link the CCTV image when the specific sensor information is detected in the FMS or to manage the history of the passengers in the access control system in conjunction with the FMS.

The battery status monitoring system can be extended to the FMS to share the text message notification system or to integrate the integrated power monitoring system with the FMS.

This research integrates sensor information, image information, and other obstacle information if existing RISD system is confined to image information recognition.

The integrated operation of these surveillance systems has the advantage of interworking and expanding with various types of surveillance systems. Table 2 compares existing and proposed designs.

Division	Existing design (Individual design)	Proposed design (Integrated Design)	The advantage of the proposed design
Manage ment Methods	Individual management of FMS, access control systems, and CCTV	Integrated management of FMS, ACS and CCTV	Monitoring into a single monitor correlated
Server	Each managed server needs	Integrated management program operating on a single server	Reduce server and administration costs
Redunda ncy	Duplicate installation of the sensor, overlapping investment costs	Remove duplicate sensors, reducing costs	Efficiency of the sensor equipment
Interope rability	No linkage to the individual operating	Interlocking of mutual information between the respective systems	Features improved utilization through convergence design

Table. 2 The comparison between the existing designs and proposed design

Table 3 shows the necessity and efficiency of this research methodology with comparison and analysis with existing research examples (Research A and B).

The integrated monitoring system design methodology of this study can be applied to all IoT fields such as building, urban disaster prevention, river monitoring as well as environmental facility monitoring of data center.

Division	Study A[8]	Study B[10]	Proposal Study
Methods	Building Maintenance Management and Fault Management	Utilizing video via a CCTV infrastructure announces disaster risk	The relationship between the monitoring equipment in the same field was expanded to different areas
Contents	Continuous monitoring the equipment status and information of the internal and external environment	CCTV video surveillance, analysis, extraction and expression related to algorithm development	Expanding and integrating the monitoring region : FMS, CCTV, ACS
Effects	Confirm the presence real time, DB storage, control command works, the problem backtracking, emergency measures and advice	Disaster risk detection rate improved. Low-cost, high-efficiency methodology presented. Disaster Surveillance scientific presentation via CCTV.	Expanded monitoring and notification system (the same as far as the other surveillance) Maximizing efficiency.
Implications	The building of various disorders monitoring, management. However, it is necessary to complement the ability to cope with a real-time image of the scene in the event of a disaster.	Limited to CCTV based methodology. It is necessary to compensate for a variety of sensor fusion method.	Expects to maximize efficiency by expanding the methodology applied in this paper to improve the integration between different sectors's monitoring & notification.

Table. 3 Comparison with other research practices, analysis and improvement

4. Efficiency analysis of integrated design

4.1. Evaluation of fault notification time by integration

Integrating the existing management of FMS, CCTV, access control system and additional systems physically and logically has three typical expected effects.

- (1) It helps decision making through comprehensive situational awareness.

- (2) It provides economical efficiency and convenience of operation by integrated management of system.
- (3) To improve crisis coping ability in case of disability and danger.

Type	Individual management		Integrated Management	Time Difference (①+②-③)
	Recognition 1 ①	Notification 1~2 ②	Simultaneous notice ③	
Failure1	1	1	1	1
Failure2	1	2	1	2
Accident	1	2	1	2
Total	3	5	3	5

Table. 4 Comparing the arrival time of the failure notification

As shown in Table 4, when designing and building the integrated monitoring system, it is possible to reduce the information delivery system in all failure situations to one unit of time, And coping is fast.

When a fire accident occurs inside a data center or the like, it is difficult for the first fire detector to request control of the door opening / closing control to the person in charge of the access control system and to promptly respond to the situation of the internal situation to the CCTV person in charge.

However, the integrated surveillance system provides comprehensive remote monitoring and control of the site environment in the event of a fire accident, and simultaneously transfers the recorded photo of the scene to a designated person at the same time as a mobile phone. It also helps to make decisions for early action through simultaneous notification system.

4.2. Decision-making information delivery method in integrated system

In order to analyze the efficiency of this study, we expressed the quantitative degree of improvement of decision - making ability of the practitioner through information integration. Figure 5 shows the flow of decision making based on the conventional method of transmitting individual information when a fire occurs.

Individual information is notified of disability or disaster information for each person in charge, and each person in charge represents the process of informing the management person by radio or wirelessly.

In Figure 5, the numbers represent the flow of information step by step.

When information is transmitted by individual systems, each person in charge receives only information about the management system, and there is not enough information sharing system among each other.

Also, until the responsible person or the final decision maker collects all the information and makes a decision it takes more time.

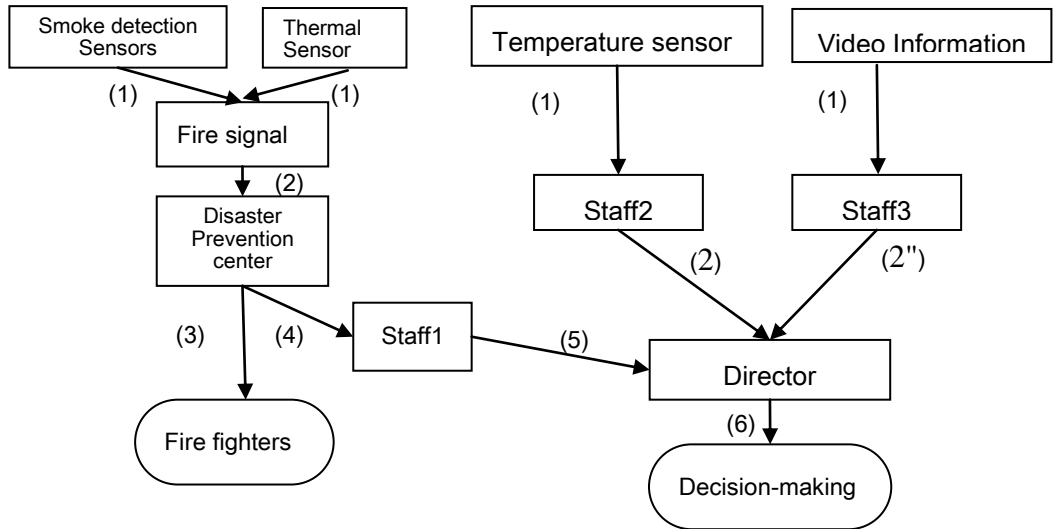


Fig. 5 Information delivery system according to the individual decision-making flow chart

For example, if the information transfer is delayed due to the absence of the responsible person (3), the decision on the image information of the site will be reserved for the decision of the person in charge.

Moreover, the fire signal transmitted via the disaster prevention center. When the fire prevention center is not able to obtain the video information of the site, it is difficult to cope with the fire emergency and it is difficult to identify the cause of the fire.

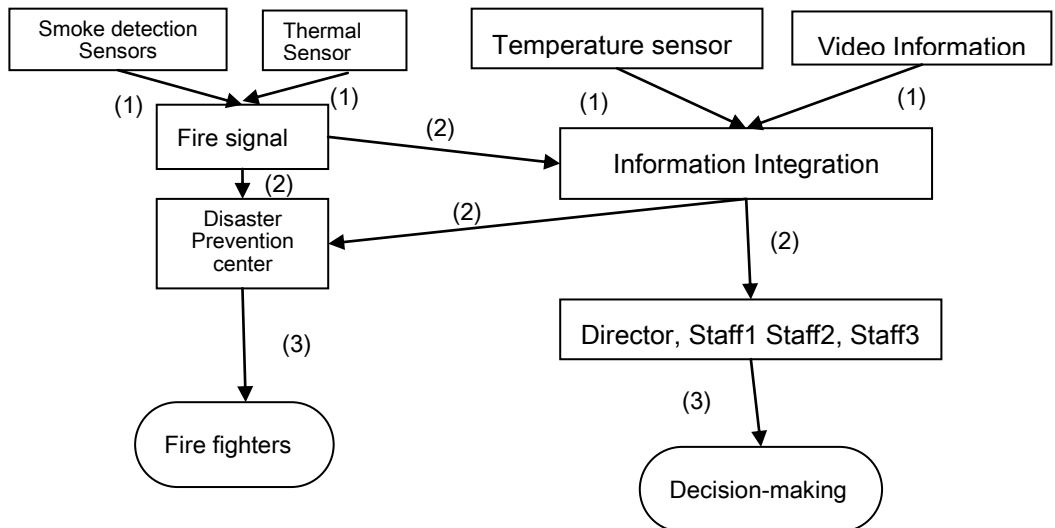


Fig. 6 Information delivery system according to the integrated decision-making flow chart

Figure 6 shows the process of transferring integrated information such as fire signal, temperature sensor, and image information to the person in charge, the person in charge, and the disaster prevention center at the same time.

The decision of the responsible person and the person in charge can also be made in the shortest time.

Decision-making considerations include smoke detectors, heat sensors, temperature sensors, and image information, and with the integrated information of each sensor and signal, the person in charge will make the most accurate and quick decisions.

As shown in the example in the fire situation, the decision making ability of the person in charge or the person in charge can be improved by 1) improving the reliability of information by integrated information, 2) providing immediate synchronicity, And 3) to help each person to cope with disasters.

5. conclusion

In this paper, we propose the design direction of the integrated monitoring system of the data center in the medium scale group as well as the researches on cloud computing and IoT which are undergoing many studies recently.

To do this, we design the scenarios for integrating the existing heterogeneous heterogeneous systems and propose a design method for them.

And the proposed design method is compared with the existing design method considering the scalability and the efficiency of the integrated design is analyzed.

Finally, a decision model for analyzing the information of individual systems in an integrated way is presented. Although the proposal of this study can be a comprehensive integrated monitoring design plan, it is recognized that importance of interoperability for prevention of disability and disaster of different kind is recognized and role definition is provided for each design element.

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