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International Telecommunication Union
Standardization Sector

Recommendation

ITU-T L.1631 (09/2023)

SERIES L: Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

Circular and sustainable cities and communities

Reference model for firefighting infrastructure management systems for buildings in sustainable cities

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Environment and ICTs, climate change, e-waste, energy efficiency; construction, installation and protection of cables and other elements of outside plant

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Recommendation ITU-T L.1631

Reference model for firefighting infrastructure management systems for buildings in sustainable cities

Summary

Recommendation ITU-T L.1631 provides an overview of a firefighting infrastructure management system (FIMS), defines the reference model of the FIMS, and provides use cases for the FIMS for buildings in sustainable cities.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T L.1631	2023-09-22	5	11.1002/1000/15601

Keywords

Building, firefighting infrastructure, sustainable cities.

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Recommendation ITU-T L.1631

Reference model for firefighting infrastructure management systems for buildings in sustainable cities

1 Scope

This Recommendation defines the reference model of a firefighting infrastructure management system (FIMS) for buildings in sustainable cities considering:

– Overview of the FIMS for buildings;

– Reference model of the FIMS for buildings;

– Use cases of the FIMS for buildings.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

None.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 firefighting infrastructure [b-ITU-T L.1630]: A set of equipment that protects or evacuates people by detecting and notifying fires, enables immediate firefighting activities at the early stage of a fire and extinguishes fires by automatic or manual operation.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 fire detection and identifying equipment (FDIE): Equipment that generates a set of fire-related data and sends it to the firefighting infrastructure management system (FIMS).

3.2.2 firefighting infrastructure management system (FIMS): A system that manages one or more FDIE(s) and supports effective response through coordination with firefighting infrastructure management service providers and firefighting stations.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

FDIE Fire Detection and Identifying Equipment

FE Functional Entities

FIMS Firefighting Infrastructure Management System

5 Conventions

None.

6 Overview of firefighting infrastructure management system for buildings in sustainable cities

A number of fire accidents have occurred in various facilities, causing significant harm to people in buildings. Many of these large-scale accidents resulting in high casualties were primarily caused by malfunctioning fire detection equipment within the buildings. In sustainable cities, building infrastructures, including firefighting infrastructure need to be designed to support durability, adaptability, and easy maintenance. However, the conventional firefighting infrastructure in buildings known as fire detection and identifying equipment (FDIE), is typically managed at the building level, making it challenging to provide comprehensive management services for sustainable cities. To address this issue, it is essential to define a comprehensive reference model for a firefighting infrastructure management system (FIMS) specifically tailored to buildings in sustainable cities.

Figure 1 provides an overview of the FIMS and the related entities for buildings in sustainable cities. The in-building firefighting infrastructure consists of multiple FDIEs, which are responsible for managing fire-related devices installed in a building. The FDIEs are managed by the FIMS via the building's local network. The FIMS reports any unusual conditions such as malfunctions of fire related devices to the firefighting infrastructure service provider via the service interface. In addition, the FDIE can request an emergency recovery to the firefighting station and report analysis data for the emergency recovery firefighting safety management organization via a city management interface. The firefighting infrastructure service provider is responsible for managing fire-related service management for fire-related devices within a building. The firefighting station serves as a facility that conducts fire emergency recovery activities, including firefighting operations. The firefighting safety management organization is a public agency that assumes responsibility for fire prevention and suppression within a municipality, county, state, nation, or a special district.

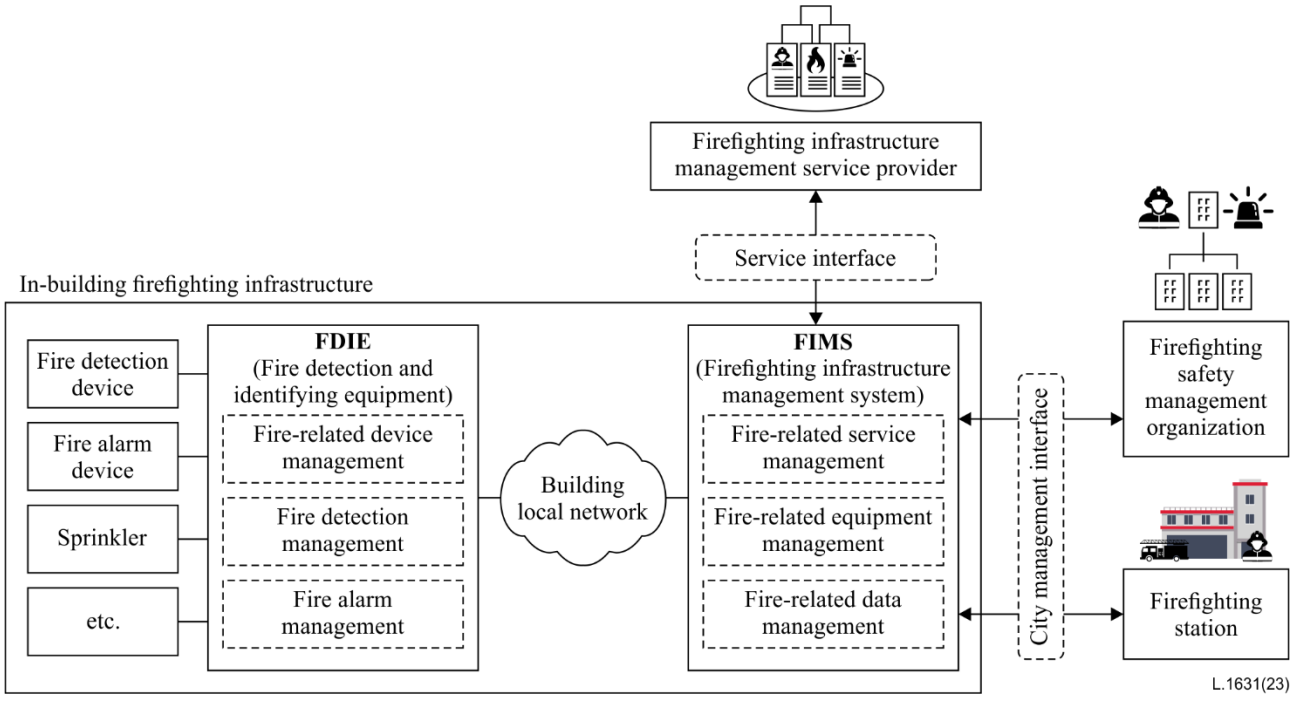

Figure 1 – Overview of firefighting infrastructure management system (FIMS) and fire related entities for buildings in sustainable cities

The FDIE performs the following functions:

– registering and managing fire-related devices with their generated data,
– detecting a fire signal or the capability failures of the devices,
– identifying the location of fire accidents that occur within the building,
– alerting the fire signal to fire alarm devices, sprinklers, etc. installed in the building, and
– sending a set of data related to both fire accidents and devices' status to the FIMS via the building's local network.

The FIMS performs the following functions:

– managing one or more FDIEs within the building,
– receiving a set of data related to fire accidents or devices' status from the FDIE,
– determining whether an emergency recovery call is necessary based on the received data,
– requesting an emergency recovery assistance from the firefighting infrastructure management service provider through a service interface if required,
– reporting the emergency recovery situation, along with the set of data to the firefighting safety management organization or the firefighting station via city management interfaces if necessary, and
– recording the gathered data, including information regarding fire accidents and the health status of fire-related devices installed in the building.

7 Reference model of firefighting infrastructure management system for buildings in sustainable cities

7.1 Overview

Figure 2 represents the block diagram for the reference model of the FIMS in buildings. The FIMS is connected to one or more FDIEs that are installed in the buildings via the building's local network.

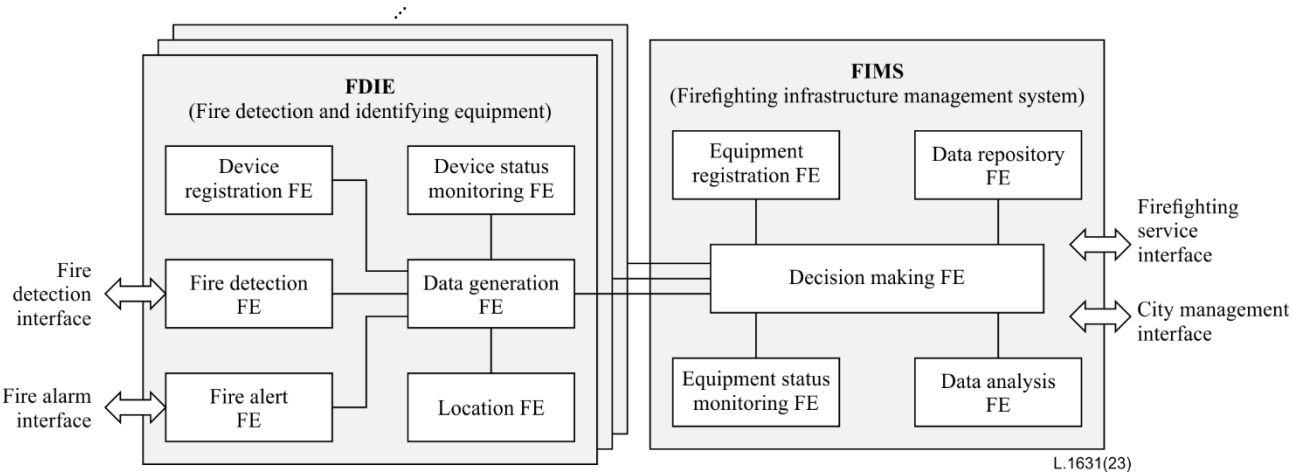

Figure 2 – Overview of reference model for firefighting infrastructure management system (FIMS)

7.2 Functional entities

The FDIE has the following functional entities (FEs):

– device registration FE: registers fire-related devices along with their relevant data in buildings;

– device status monitoring FE: obtains the generated data from fire-related devices;
– fire detection FE: detects fire signals from fire detection devices or receives manual triggering signals in buildings;
– fire alert FE: alerts the fire signal to fire alarm devices, sprinklers, etc. installed in buildings;
– location FE: obtains location information of the fire accident in a building;
– data generation FE: generates a set of data related to fire signals or devices' status.

The FIMS has the following FEs:

– equipment registration FE: registers one or more FDIEs with their relevant data in the buildings;
– equipment status monitoring FE: obtains generated data from the FDIEs;
– data repository FE: records the gathered data, including fire accident-related information and the health status of fire-related devices;
– decision making FE: determines whether the fire accident requires emergency recovery based on the received set of data by interworking with one or more FDIEs;
– data analysis FE: analyses the received set of data to request emergency recovery or reports malfunctioning of fire-related devices installed in buildings.

8 Use cases of firefighting infrastructure management system for buildings in sustainable cities

8.1 Use case for equipment registration and management

Figure 3 shows the workflow of the FIMS in the case of FDIE registration and management. The FDIE is responsible for registering fire-related devices in buildings and generating their related data, including capabilities and location for registration. The FDIE transmits its registration data to the FIMS and awaits acknowledgement. Based on the received registration data, the FIMS registers the FDIE to be managed by itself.

Each FDIE continuously monitors the status of fire related devices within the building and transmits the corresponding status data to the FIMS. After analysing the status data from the FDIEs, the FIMS determines whether any unusual conditions exist for each FDIE, such as malfunctioning of fire-related devices, etc. If there are no unusual conditions detected for the FDIE, the FIMS reports the analysis data to the firefighting infrastructure management service provider.

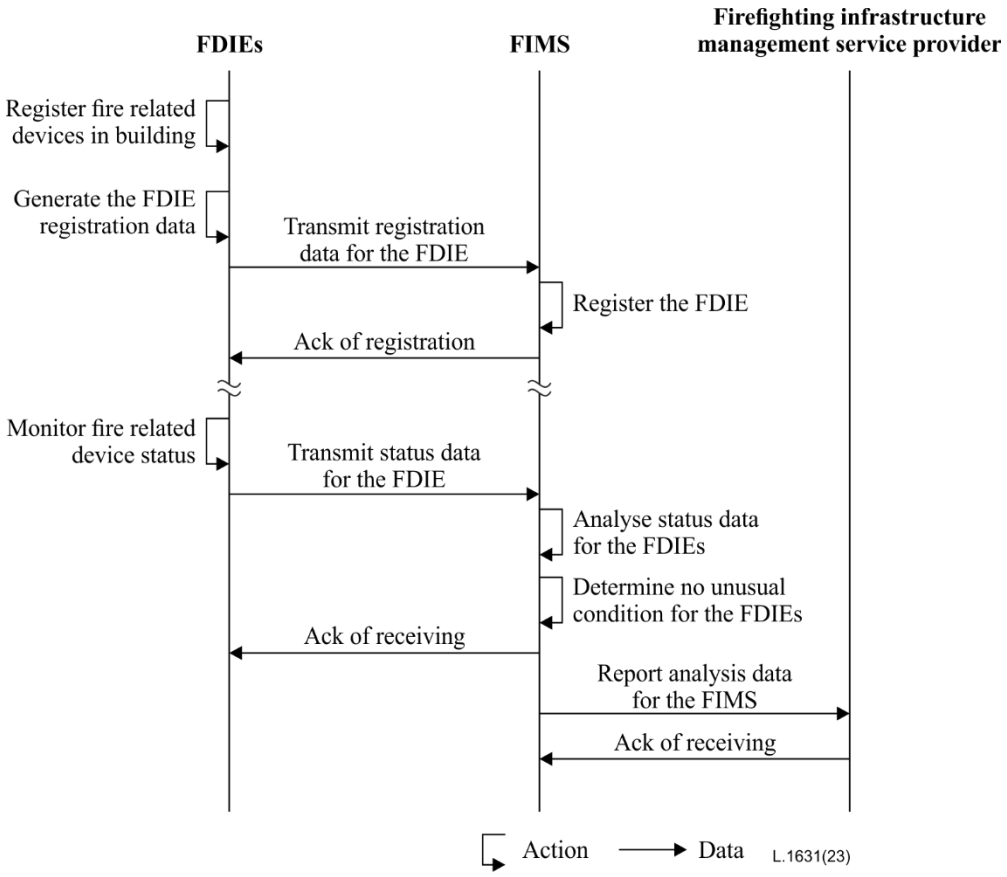

Figure 3 – The workflow of the FIMS in case of FDIE registration and management

8.2 Use case for unusual condition detection

Figure 4 shows the workflow of the FIMS in case of detecting unusual conditions in FDIEs. Each FDIE monitors their fire-related device status and transmits the corresponding status data to the FIMS. The FIMS analyses the received data and determines whether the condition for each FDIE is unusual, such as the malfunctioning of fire-related devices, etc. If an unusual condition is detected for one or more FDIEs, the FIMS notifies the FDIEs about the unusual condition and reports the malfunctioning of the FDIEs to the firefighting infrastructure management service provider. The FIMS waits for an acknowledgement from the service provider. The FDIEs, upon receiving the notification, identify the location of the unusual condition and attempt to fix it. Once the FDIEs have addressed the unusual condition and achieved recovery, the FIMS verifies the recovery and reports the recovery confirmation to the service provider. The FIMS awaits acknowledgement from the service provider upon reporting the recovery confirmation.

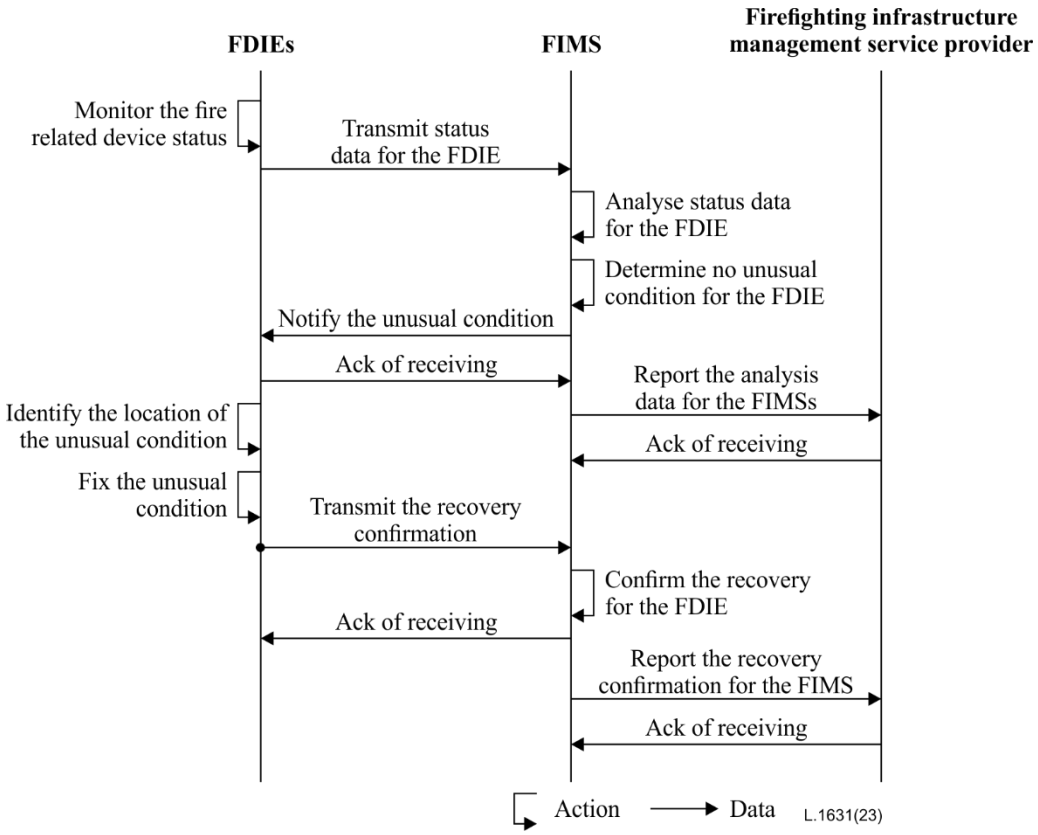

Figure 4 – The workflow of the FIMS in case of detecting unusual conditions in FDIE

8.3 Use case for emergency recovery request

Figure 5 shows the workflow of the FIMS in case of an emergency recovery request. When a fire signal is detected, the FDIE identifies the location of the fire signal and generates a set of data for it. The FDIE then transmits the set of data to the FIMS and awaits acknowledgement. The FIMS analyses the received set of data for the fire signal and determines whether the fire accident has occurred. Upon confirming the occurrence of the fire accident, the FIMS initiates an emergency recovery request and waits for an acknowledgement. If the severity of the fire accident is high, the FIMS directly requests emergency recovery assistance from the firefighting station with the relevant set of data. After analysing the emergency recovery situation, the FIMS reports both the fire accident and the emergency recovery situation to the firefighting safety management organization via the city management interface. The FIMS awaits acknowledgement from the firefighting safety management organization upon reporting.

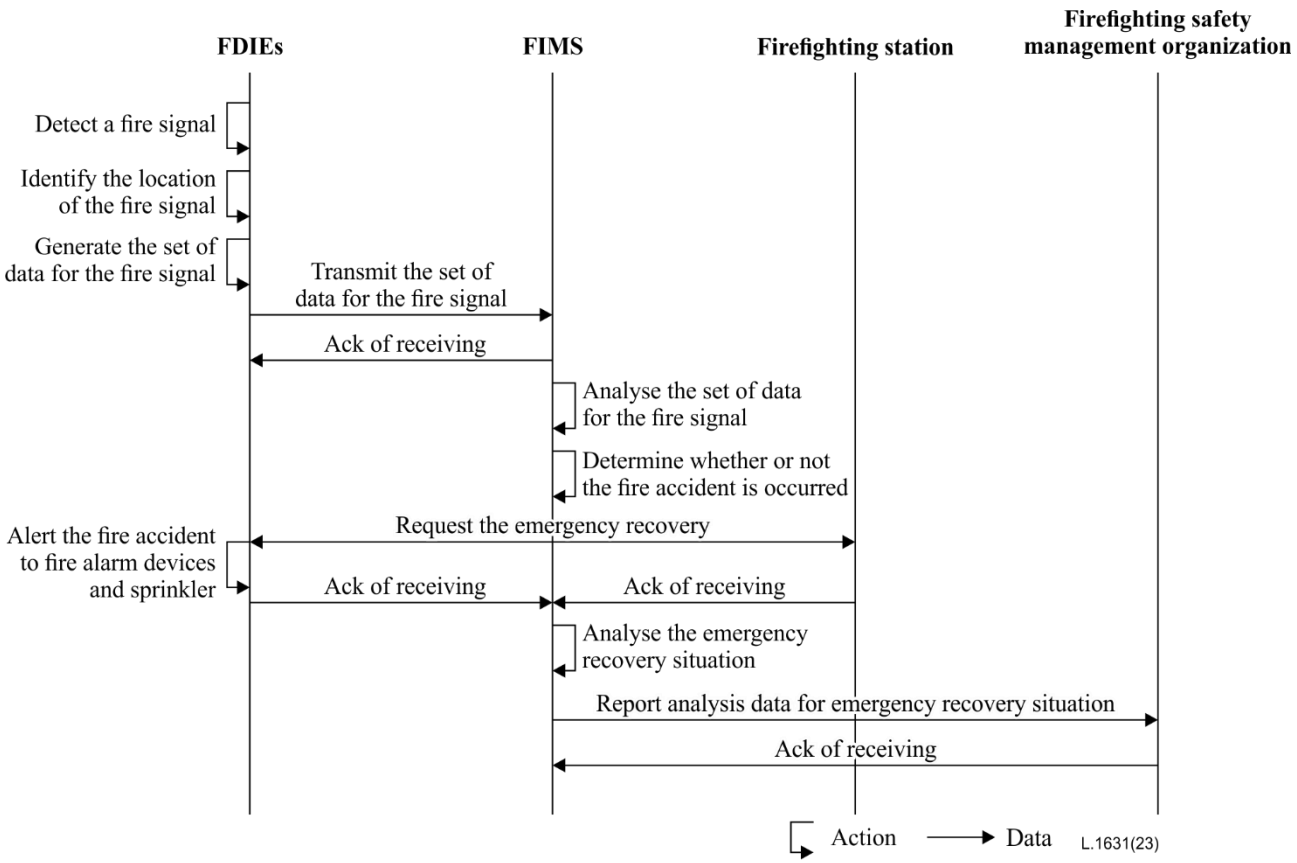

Figure 5 – The workflow of the FIMS in case of an emergency recovery request

8.4 Use case for emergency recovery cancellation

Figure 6 shows the workflow of the FIMS in case of an emergency recovery cancellation. When a fire signal is detected, the FDIE identifies the location of the fire signal and generates a set of data for it. The FDIE transmits the set of data to the FIMS and awaits acknowledgement. The FIMS analyses the received set of data for the fire signal and determines whether a fire accident has not occurred. If the FIMS determines that the fire accident has not occurred, it requests an emergency recovery cancellation from the FDIE and waits for an acknowledgement.

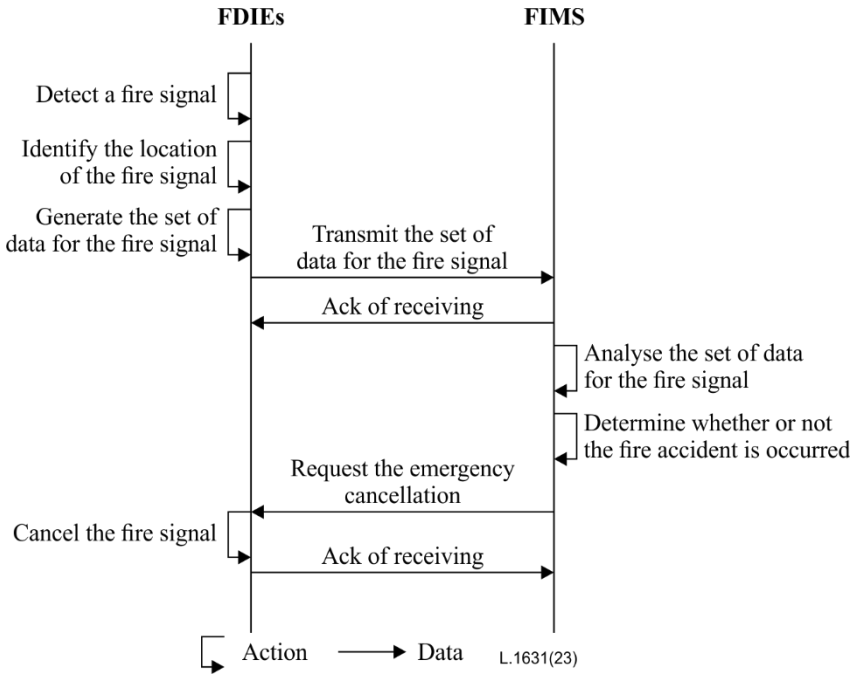

Figure 6 – The workflow of the FIMS in case of emergency recovery cancellation

Bibliography

[b-ITU-T L.1630] Recommendation ITU-T L.1630 (2023), *Framework of a building infrastructure management system for sustainable cities*.

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