

승강기 안전제도 및 표준화 동향 국제세미나

International Seminar on Elevator Safety System and Standardization

Standards development for 'Framework of Internet of things based monitoring and management for lifts'

Participate in standards development :

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8 November 2023



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Elevator industry and ecosystem

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Standard development status of IoT Gateway for remote monitoring of elevators

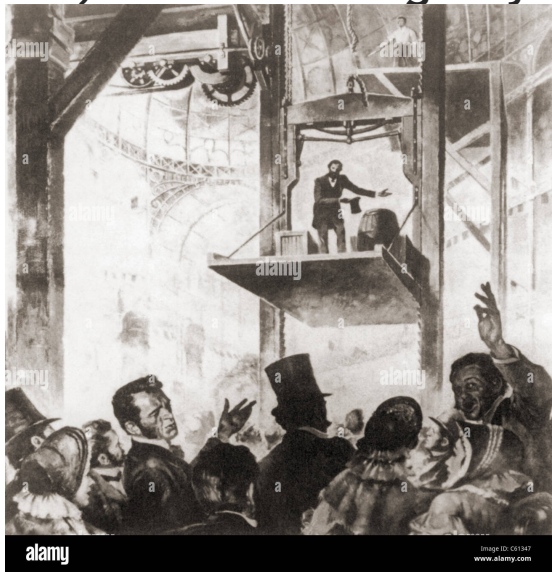
III

Application and utilization of standards

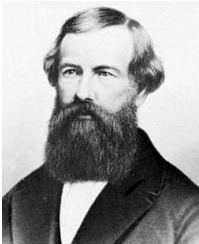


I. Elevator industry and ecosystem

prologue ... Invention of the elevator > Changes in architecture and construction technology → High-rise, smart building/city → Space elevator



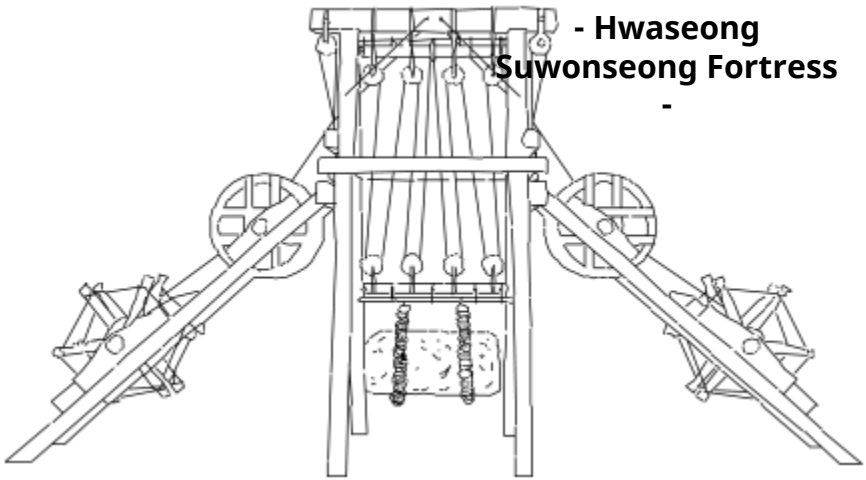
- Otis demonstrates patented safety lift at 1854 New York World's Fair



- Elisa Otis -



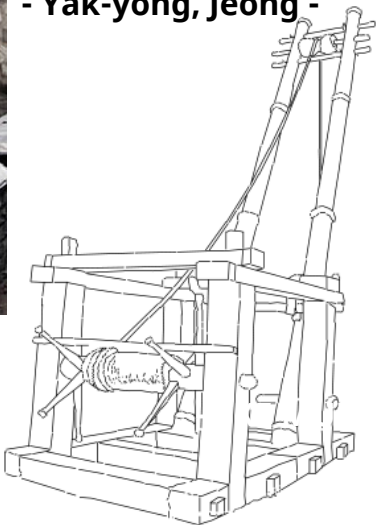
- Hwaseong Suwonseong Fortress -



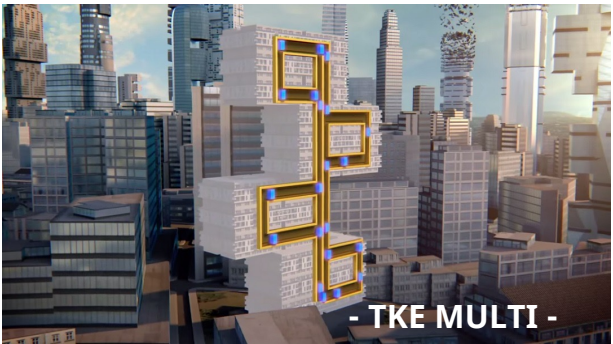
- lifter(거중기) -



- Yak-yong, Jeong -



- 녹로 -



- TKE MULTI -



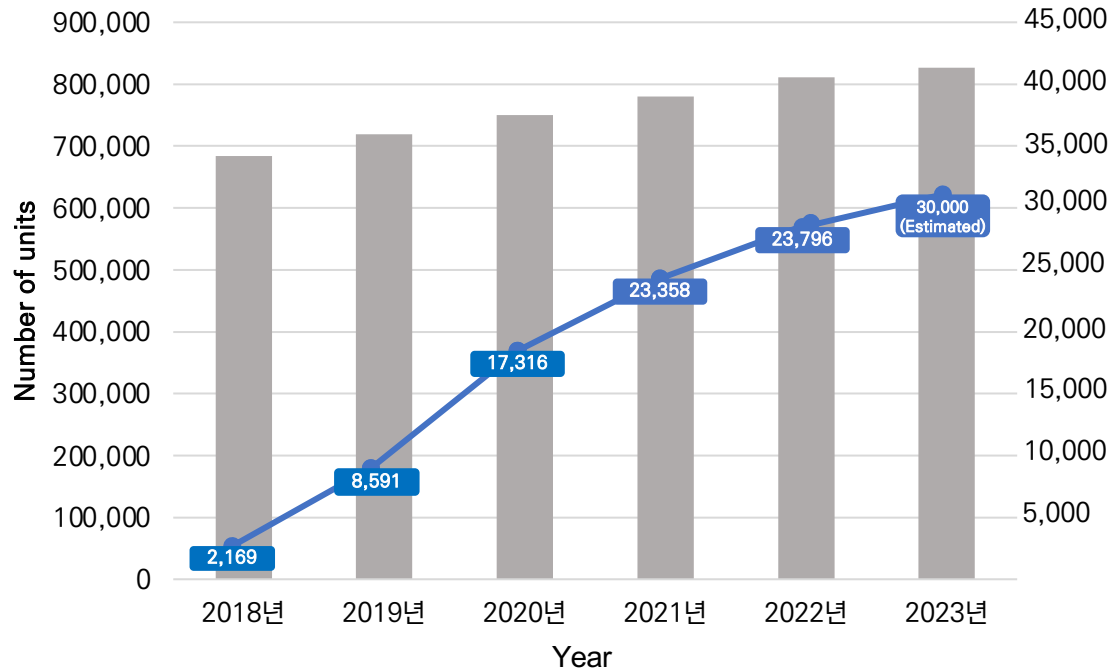
Lotte Tower

01 Domestic elevator market needs new solutions to improve safety

The number of domestic elevators is 828,993 (as of July 31, 23), and the number of accidents and breakdowns is also increasing.

- ▶ Existing local elevator management is insufficient to prevent safety accidents and respond in a timely manner, so a new solution is needed.

Trends in the number of domestic elevators and the number of breakdowns

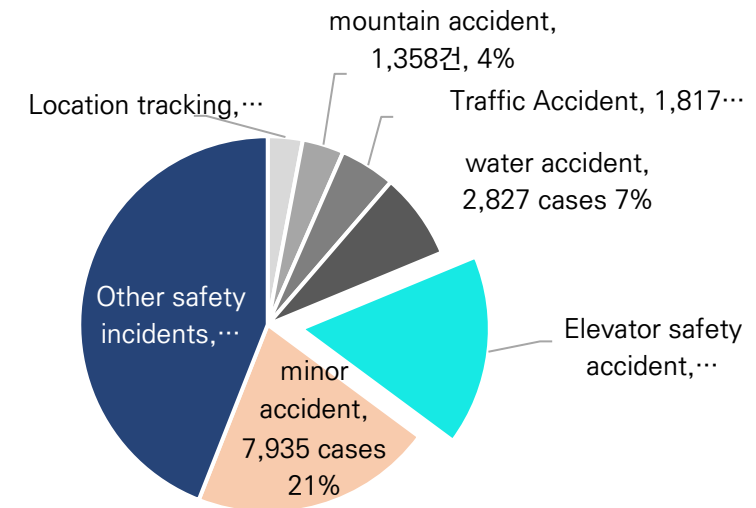


Source: Korea Elevator Information Center

* As of March 2019, reporting of elevator breakdowns has become mandatory due to the revision of the Elevator Safety Management Act.

Annual number and proportion of rescue calls by cause (2021)

Elevator safety accidents are the number one cause of rescue dispatch based on single cause (16%), 3.4 times the number of traffic accidents



Source: Seoul Disaster Prevention Center

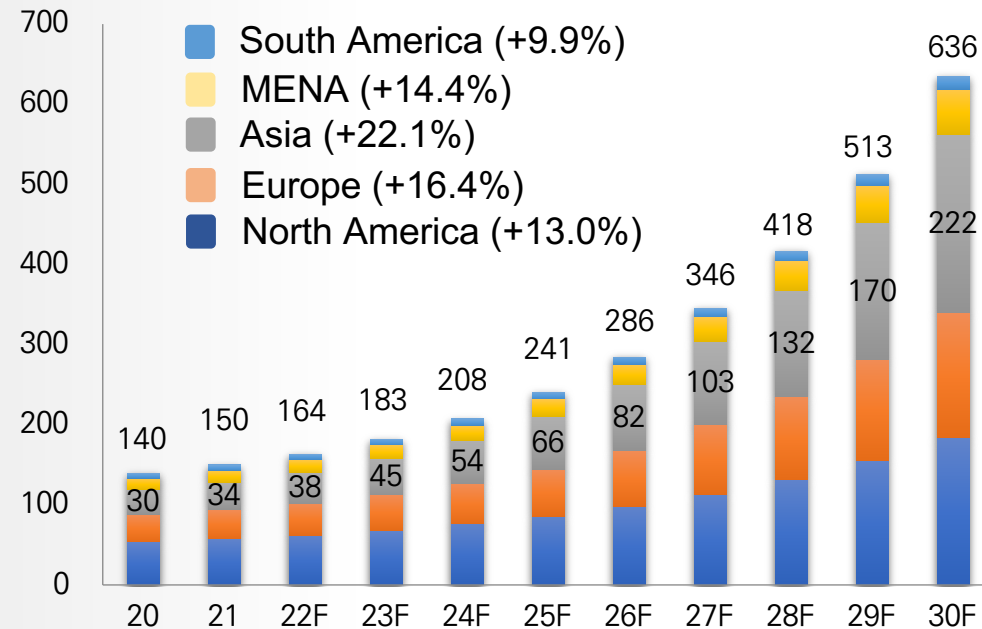
02

Global smart elevator market outlook

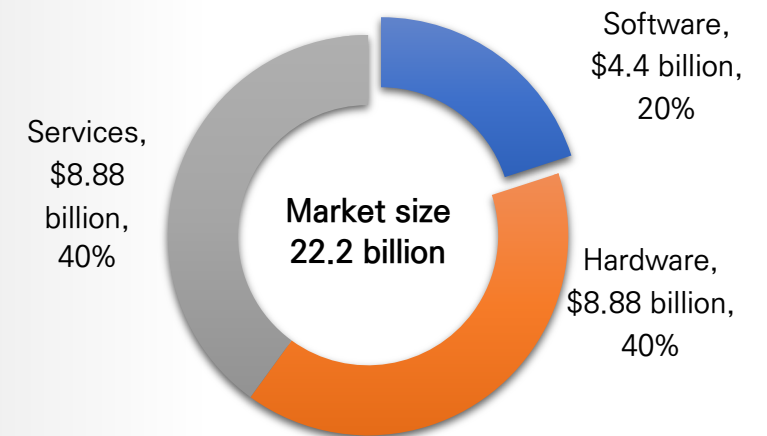
The global smart elevator market is expected to grow from \$16.4 billion in 2022 to \$63.6 billion in 2030 (CAGR +16.3%).
Asian market expected to grow at an average annual growth rate of 22.1% over the next 10 years

IoT elevator market size forecast by region

(Billion dollars)

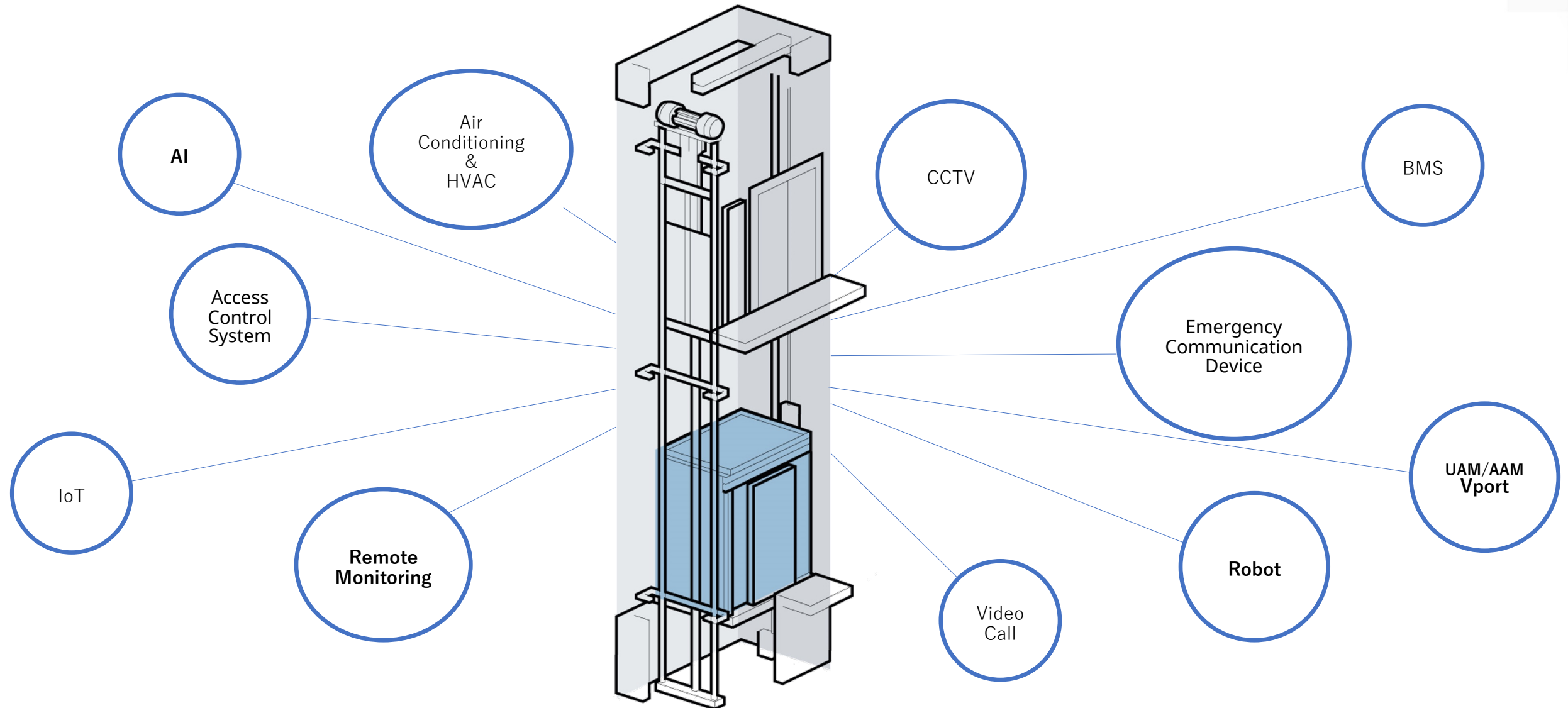


IoT Asia IoT Elevator Market Breakdown



03

Platforming Elevator_Expanding Elevator Ecosystem



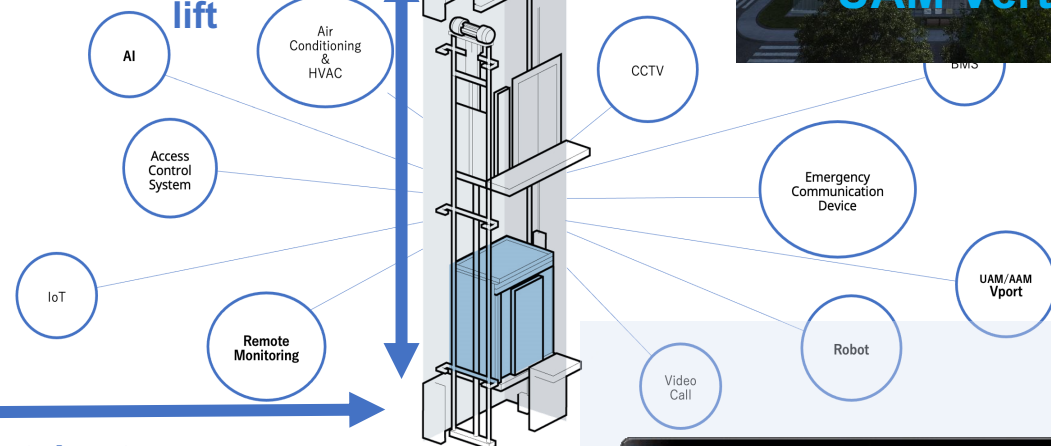
02 Platforming Elevator_ Highlighting the importance of interoperability between systems



Smart city /
Smart building Infra



Vertical autonomous
lift



Horizontal autonomous
robots

Urban air mobility



II. IoT Gateway Standard Development for Elevator Remote Monitoring

01

Development of Elevator Remote Monitoring Standards

Purpose of Standard

Development of **IoT Gateway Protocol and Data Model** for Smart Elevator
and Control Platform (ITU-T SG20, ISO TC178)



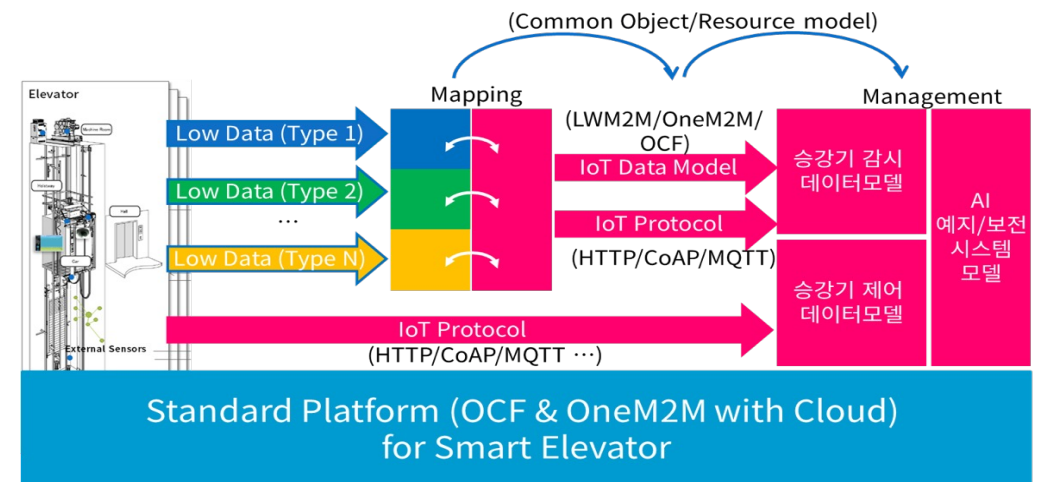
Part 1 : Structural and functional requirements



Part 2 : ELMP-485 Protocol



Part 3 : Monitoring Data Mode



Standardization strategies at home and abroad ► Minimize industrial risks arising from market volatility
 Proactive development of innovative technologies ► Continuing to strengthen competitiveness within the industry
 Further development of standard patents and establishment of new industry standards in the process of market, service expansion, and technological advancement

Development of elevator specialized for small and medium enterprises and establishment of organization standards



한국승강기공업협동조합

- Establishment of Standard for Organization of Korea Elevator Industry Cooperative (2017)
 - Electrical Elevator Manufacturing and Assembly Quality Standards
- Establishment of the Small and Medium Business Organization Standard (MR/MRL) (2015) and amendment (2020)
 - Development of mid-term specialized elevator and UNICORN joint model development

Participation in the creation of TTA standards



- **Participation in the creation of TTA standards (2020)**
 - Korea's only information and communication organization standard-setting agency
 - ICT standardization and test certification
 - PG1002 (Internet of Things Networking) within TC10 (Intelligence Information-Based Technology Committee)
 - Establishment of Elevator Remote Monitoring Family Standards in Project Group (Part 1 to 3)

Establishment of national standard KS standards



국가기술표준원
Korean Agency for
Technology and Standards

- **Establishment of national standard KS standard (2018-2020)**
- Operated KoELSA 'Smart Elevator Standard Specialized Committee'
 - 20 industry-academic representatives including 3 major companies participated
 - Participation as a research institute organized by SMEs (M2M Tech)
- National standards are adopted and applied by national public institutions such as LH and Korail

IoT and Smart Cities and Elevators Participate in International Standards



- IETF (International Internet Standardization Organization)
Application of International Standard IoT Technology
- International Standard ITU-T SG20
 - Proposed, participated in the development of standards for IoT and smart city technologies ► Adopted
 - Y.4420 Standard approval for IoT-based monitoring and management framework for lifts (2021.07)
- **Participating in International Standard ISO TC178**

Development of Elevator Remote Monitoring Standard

Establishment of National Standard (KS) & Governance

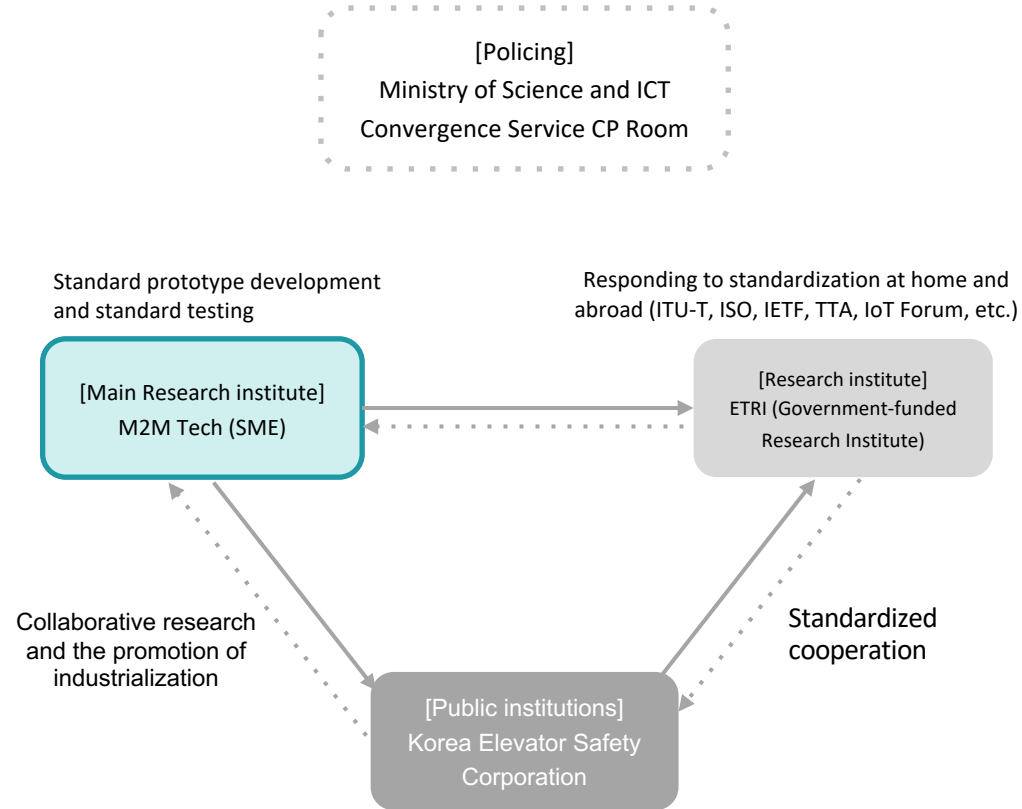
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KS B 6921

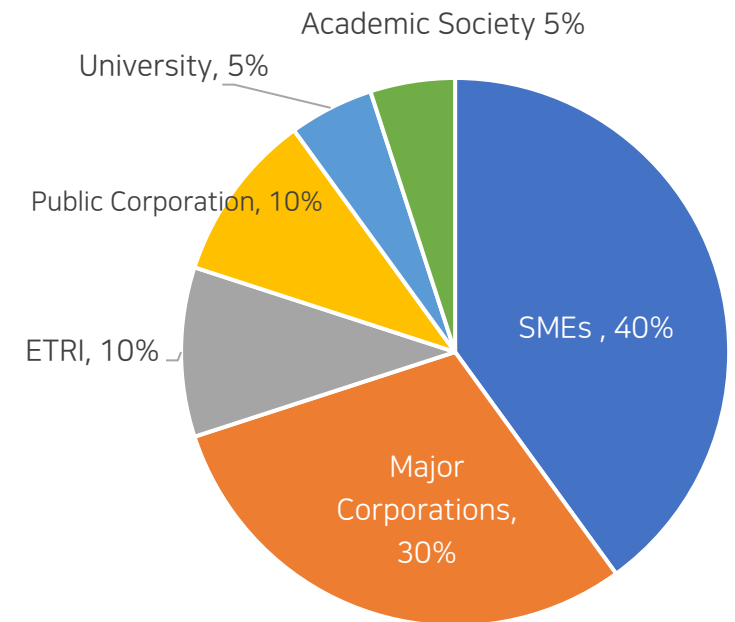
KS

엘리베이터 원격 모니터링을 위한
사물 인터넷 게이트웨이 —
모니터링 데이터 모델
KS B 6921:2023

산업표준심의회
2023년 2월 20일 제정



Rate of Elevator Standard Development
Specialist Commissioners

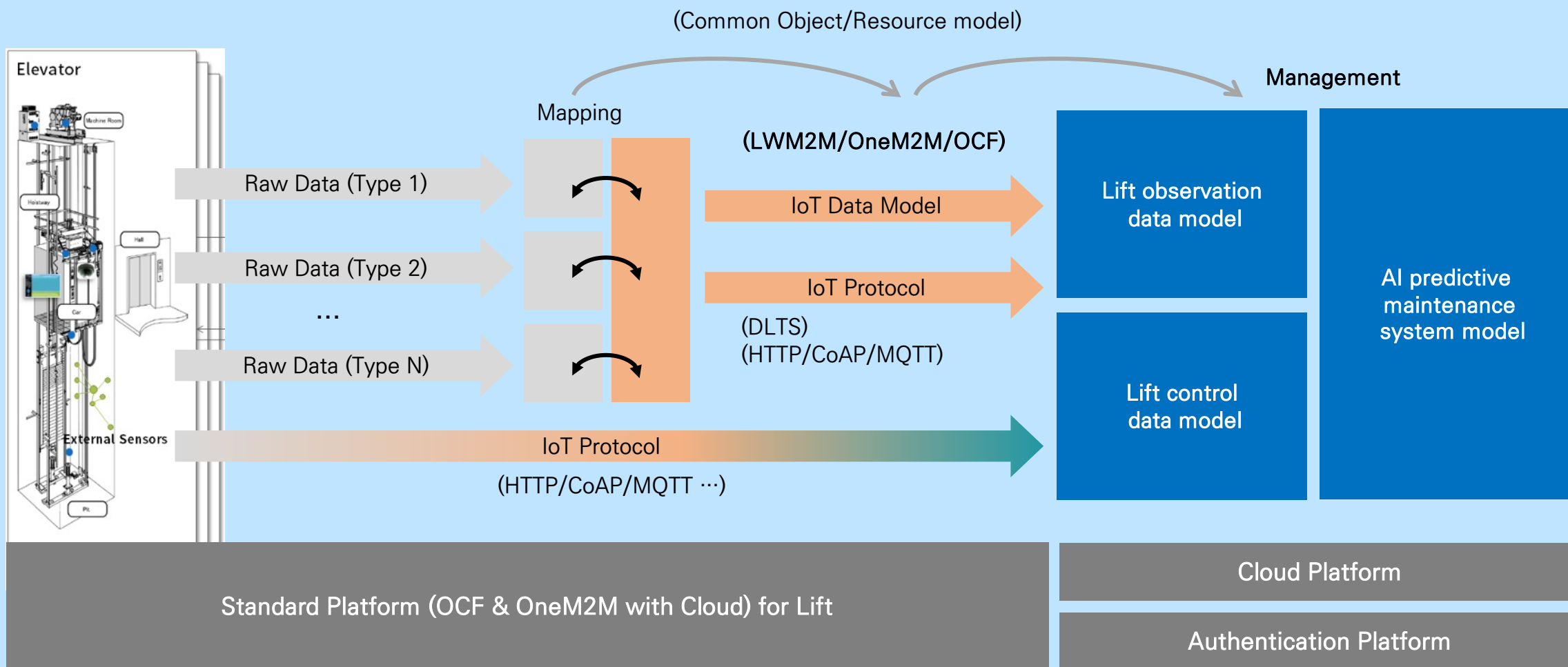


2018 – 2020 (3 years)
20 industry-academic representatives including 3 major
companies participated

IoT Gateway Standard for Remote Monitoring of Elevators

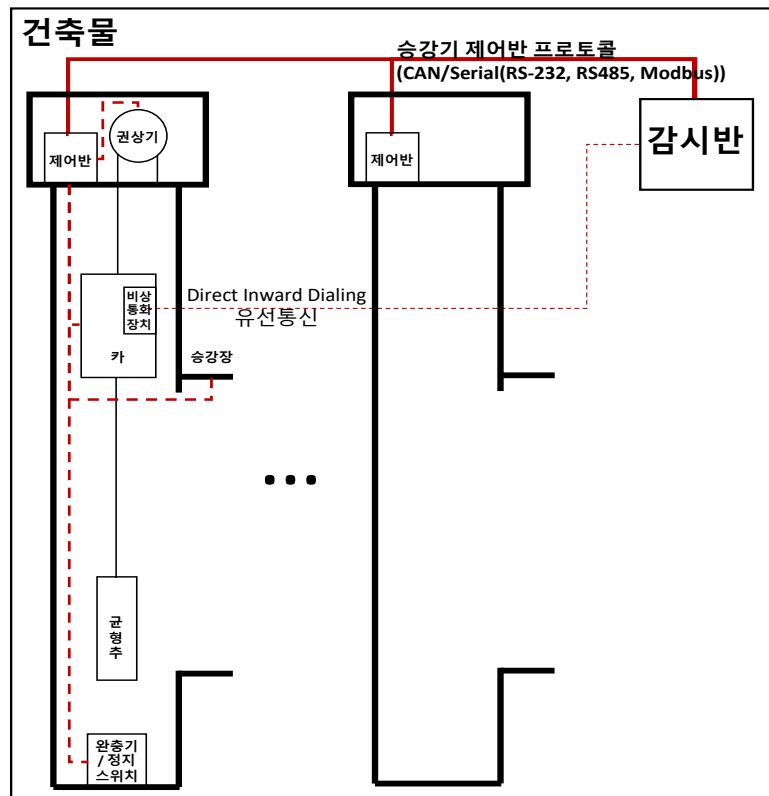
_ITU-T SG20 International Standard approval

Framework for remote monitoring of elevators

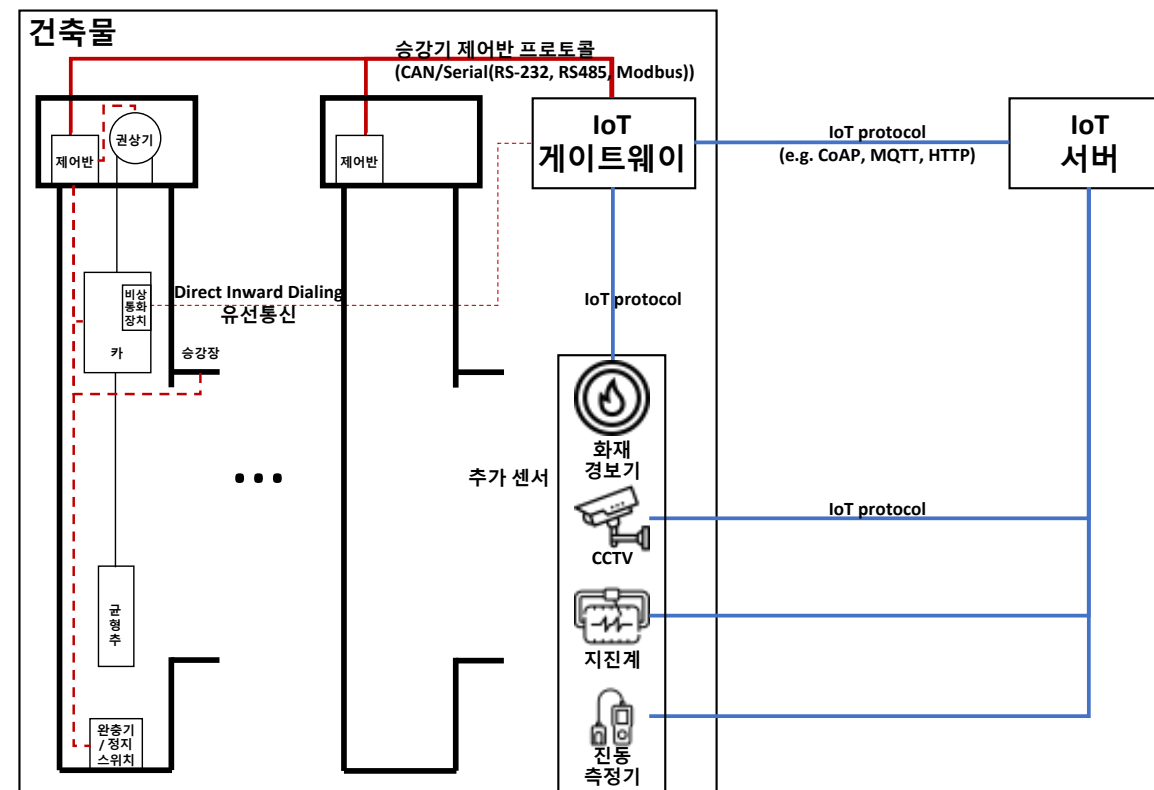


05 Contents of IoT Gateway Standard for Remote Monitoring of Elevators

- Part 1 : Structural and functional requirements [1]



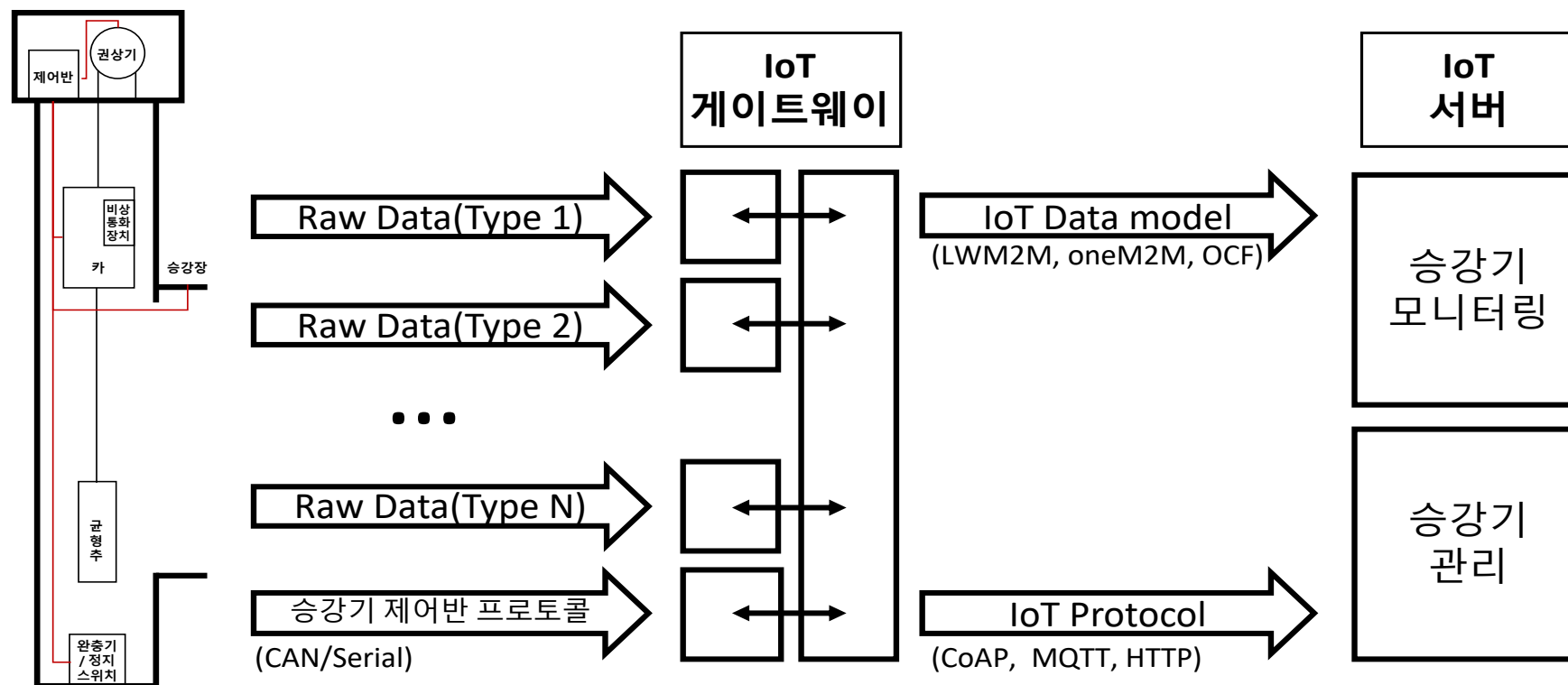
<Legacy configuration diagram for elevation monitoring>



<Configuration diagram of the elevator remote monitoring system>

05 Contents of IoT Gateway Standard for Remote Monitoring of Elevators

- Part 1 : Structural and functional requirements [2]



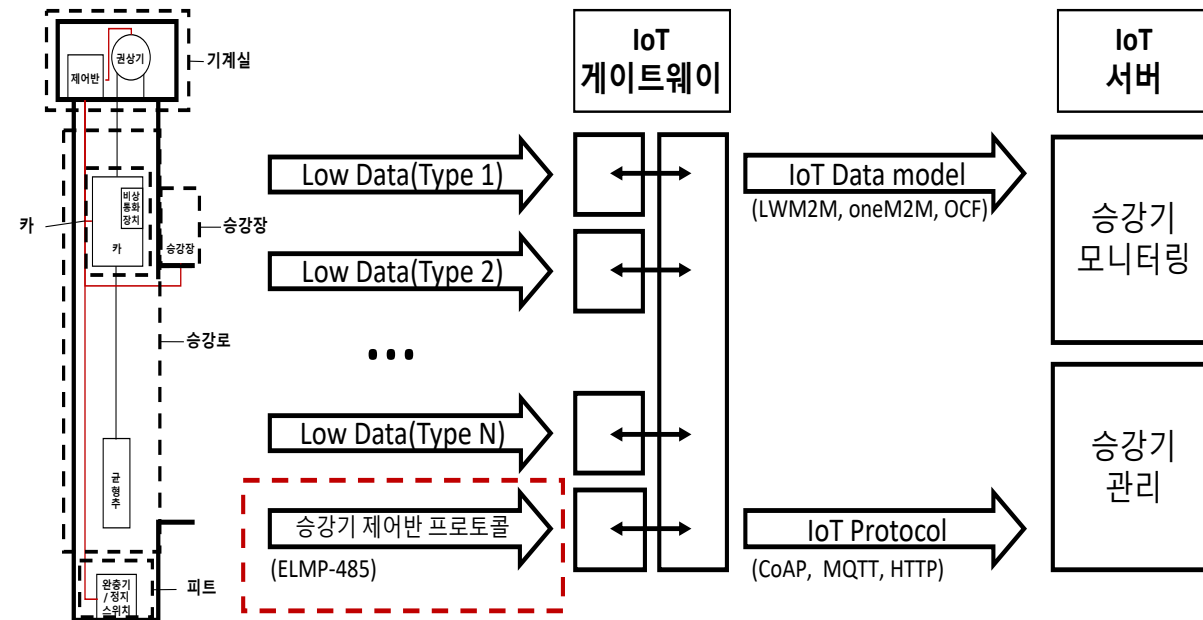
<Configuration diagram of the elevator and IoT server>

Contents of IoT Gateway Standard for Remote Monitoring of Elevators

- Part 2 : ELMP-485 Protocol

• ELMP-485, **E**levator **M**onitoring **P**rotocol over RS-**485**

- Half Duplex Asynchronous mode (RS-485)
- No parity bit
- Stop bit = 1
- 38,400bps
- Big Endian



시작 플래그 (SF-0x7E)	목적지 주소 (DA)	메시지 종류 (Type)	데이터 길이 (Len)	데이터 (DATA)	순환중복 검사 (CRC)	종료 플래그 (EF-0x7E)
1 byte	1 byte	1 byte	2 <u>byte</u>	n byte	2 <u>byte</u>	1 byte

<ELMP-485 Message Structure>

Contents of IoT Gateway Standard for Remote Monitoring of Elevators

- Part 3 : Monitoring Data Mode

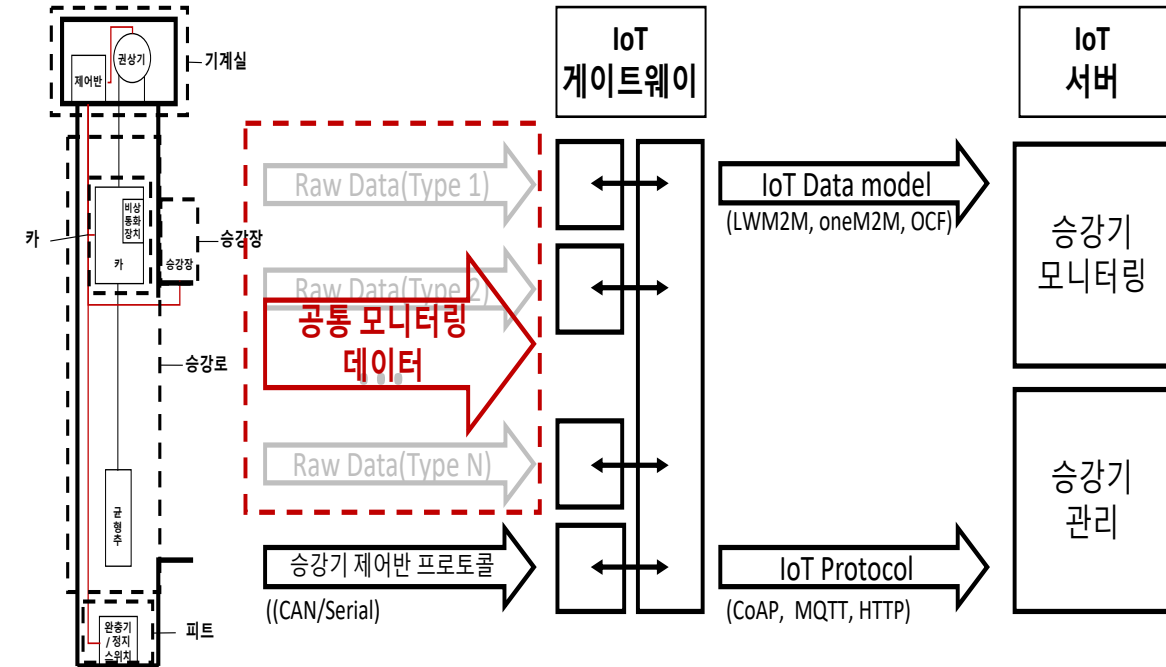
• Common Data Model

• Coverage

- Elevator Control Panel
- Elevator Monitoring Gateway (e.g IoT Gateway)
- Application server (e.g , IoT server)

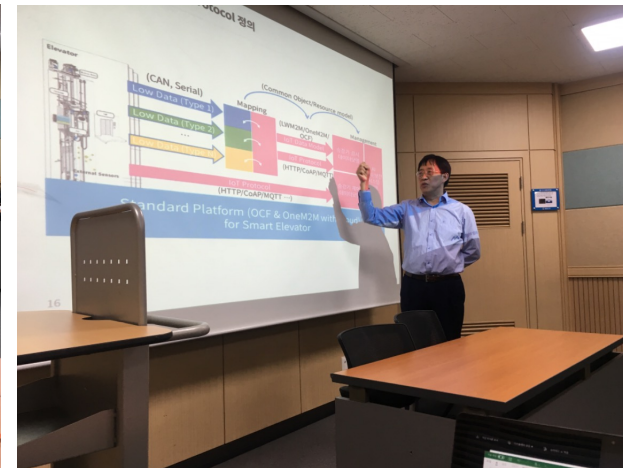
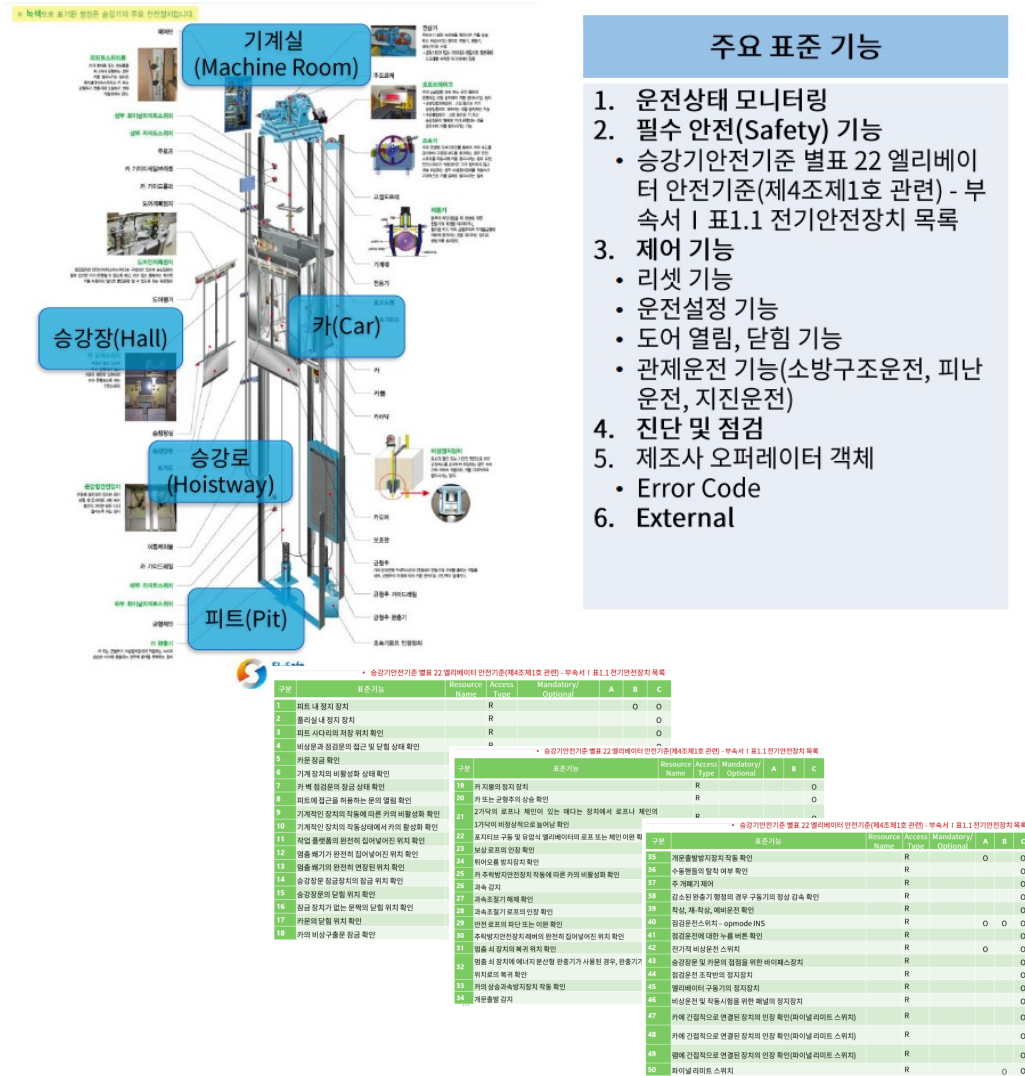
• Classification

- Elevator Basic information
- Elevator Operation Status
 - Machine Room, Car, Hoist Way, Platform, Pit Group
- Elevator Operation Statistics
- Elevator failure information



<Elevator Remote Monitoring System>

Elevator Industry Ecosystem Representatives Participatation



Elevator International Standard Development and Approval _ITU-TSG20 _Y.4420

- ITU-TSG 20 Standard Approval: 2021.7 (Electronic Newspaper 2021.6 "Korea-Made Elevator Control Framework, First International Standard Approval")
 - ✓ IoT-based Monitoring and Management Framework for Y.4420 Elevators

International Telecommunication Union

ITU-T
TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.4420
(07/2021)


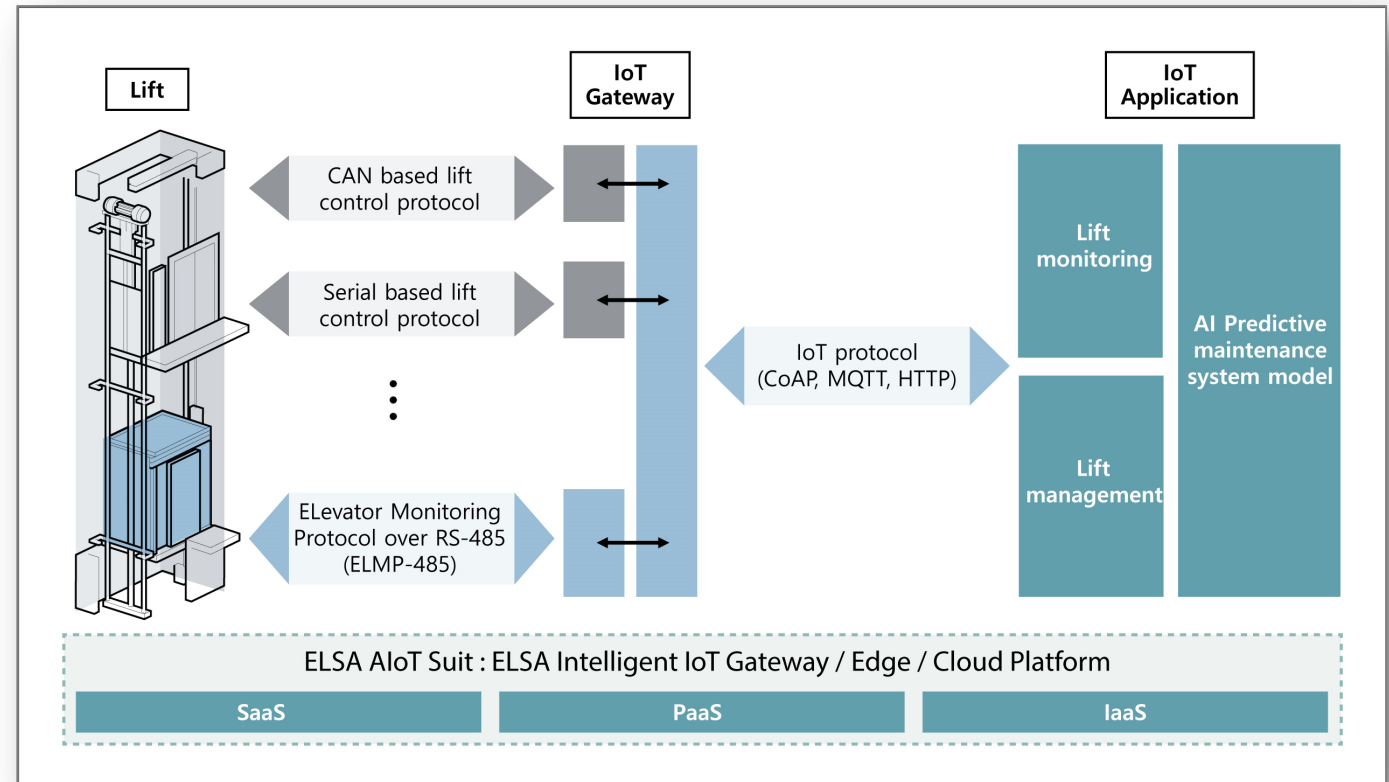
SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS,
NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Internet of things and smart cities and communities –
Frameworks, architectures and protocols

**Framework of Internet of things based
monitoring and management for lifts**

Recommendation ITU-T Y.4420

ITU-T

- ITU-TSG 20 Standard Approval: December 2019
 - ✓ Y.Sup56 Smart Elevator Monitoring in a Smart City Reflects Use Case

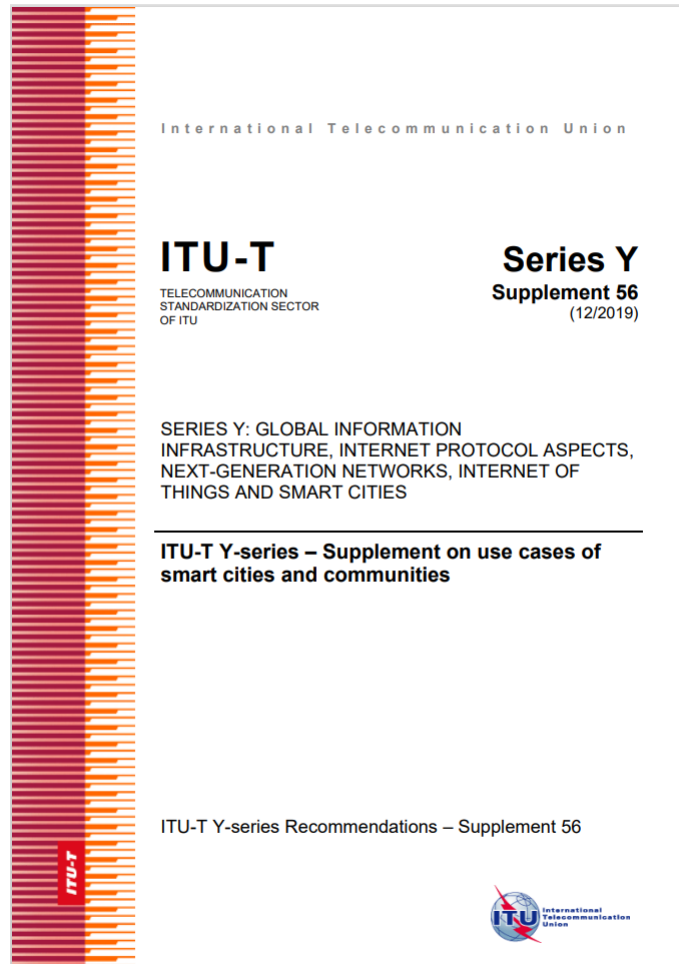


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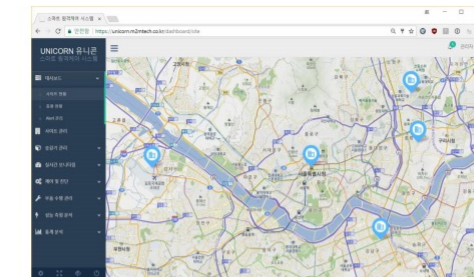


Figure 8-9 – Interworking between smart city operation centre and lift system

- c. Pre-requisites: None
- d. Pre-conditions (if any)

The applications used by users and engineers are different. Using the application which is made available in the users' devices, users provide location information updates to the smart city operation centre and receive nearby lift failure information. The smart city operation centre notifies the engineers located at the shortest distance from the failed lift.
- e. Triggers: When an emergency alarm, out of service (fault) or fire operation is reported.
- f. Scenario
 - 1) Interworking between smart city operation centre and lift system
 - If an emergency alarm, out of service or fire operation event is detected in the elevator. An event is sent to the smart city operation centre.
 - Smart city operation centre sends events to nearby users to prevent further accidents, or to engineers to repair faults.
 - The engineers complete the inspection of the event, send a completion message to the smart city operation centre. The smart city operation centre receives messages from engineers, or receives complete events directly from the lift system.
- g. Process flow diagram
 - 1) Interworking between a smart city operation centre and a lift system (see Figure 8-10)



III. Application and utilization of standards

01 ELSA IoT Suite _ AI and IoT Elevator Remote Care Solution

Elevator Smart Advisor, ELSA

Automatic fault detection ► Remote resolution ► Intelligent systems to be reported



ELSA IoT Gateway™

Data collection sensors / device

- Manufacturer/vendor independent intelligent IoT devices that connect core devices, sensors (Things) and mobile devices in various facilities on site to the cloud center

ELSA Edge™

Local analysis/processing

- Analyzing real-time processing of information and data received by the cloud with edge computing
- Services available anytime, anywhere, on any device

ELSA Cloud™

Big Data Analysis, AI/DL Processing, Cloud Platform

- Receive and process big data in real-time with robust security
- Integrated, open platform for fast data transfer on any mobile device

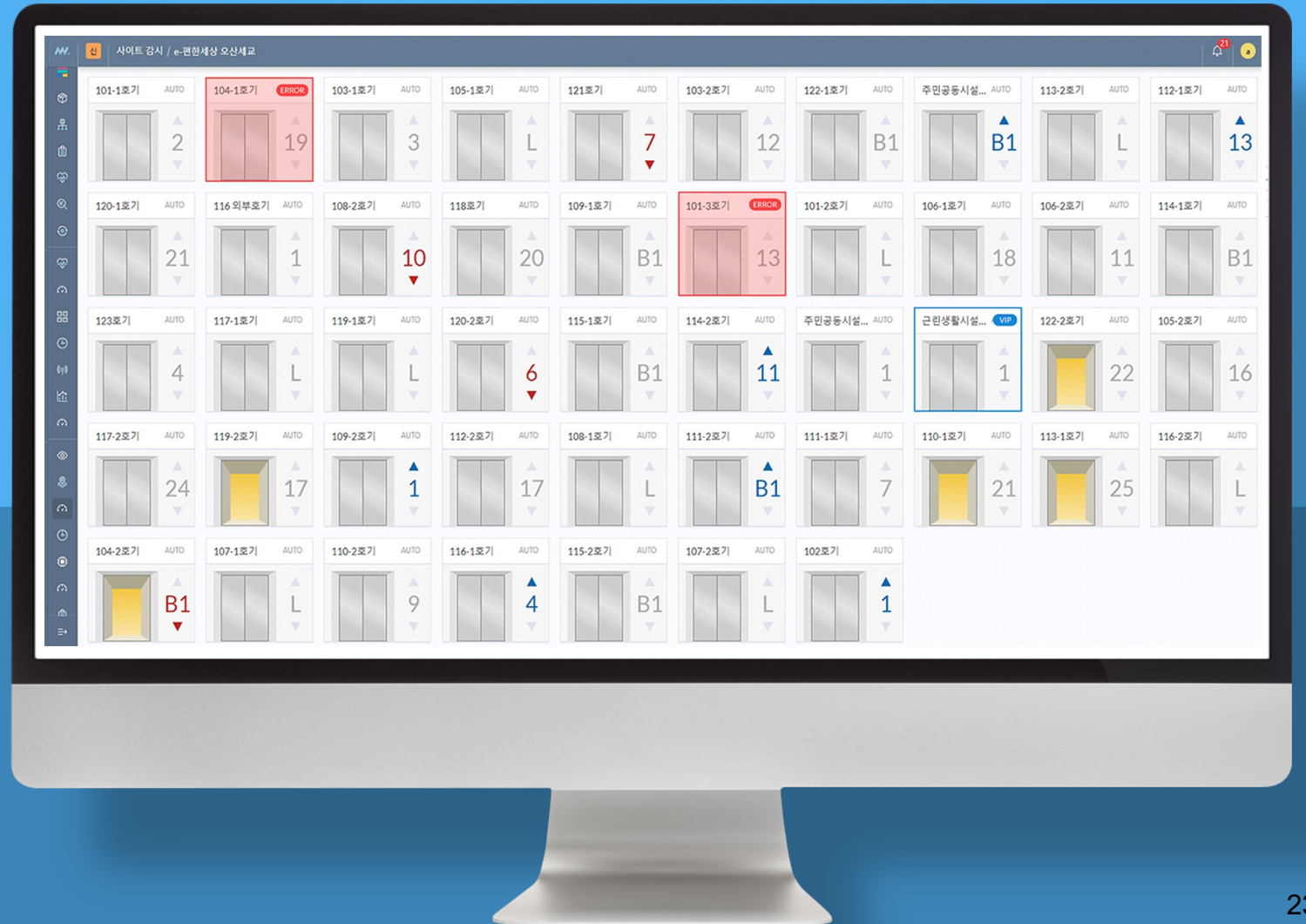
ELSA Cloud SaaS™

Remote control, health monitoring, statistics web/app platform

- Real-time health check and remote response as a responsive web/app service
- Monitor workflow, manage people, report statistics, provide a clear UX/UI

Intelligent Systems for

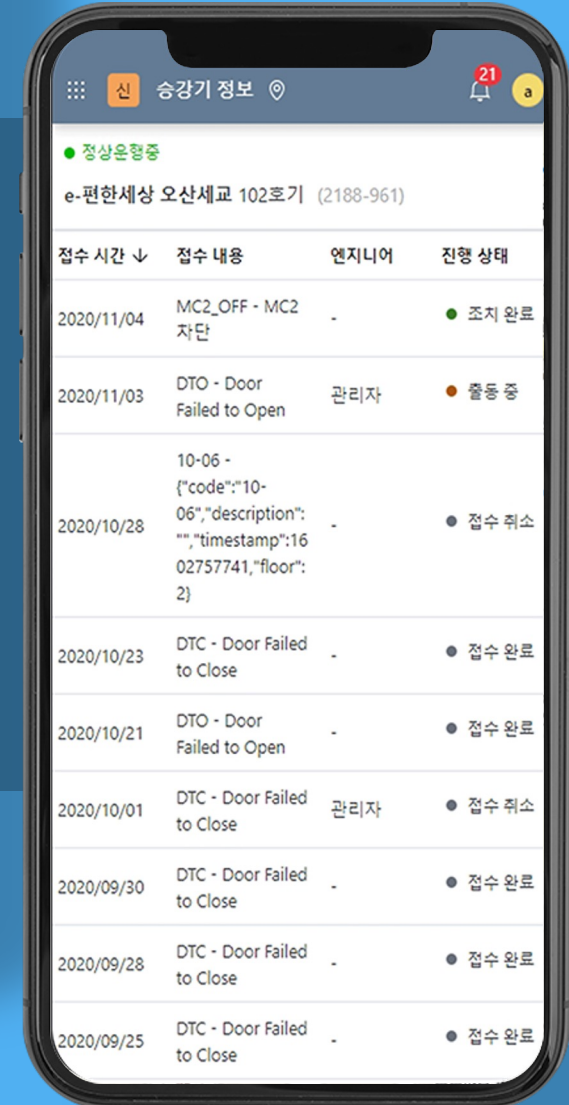
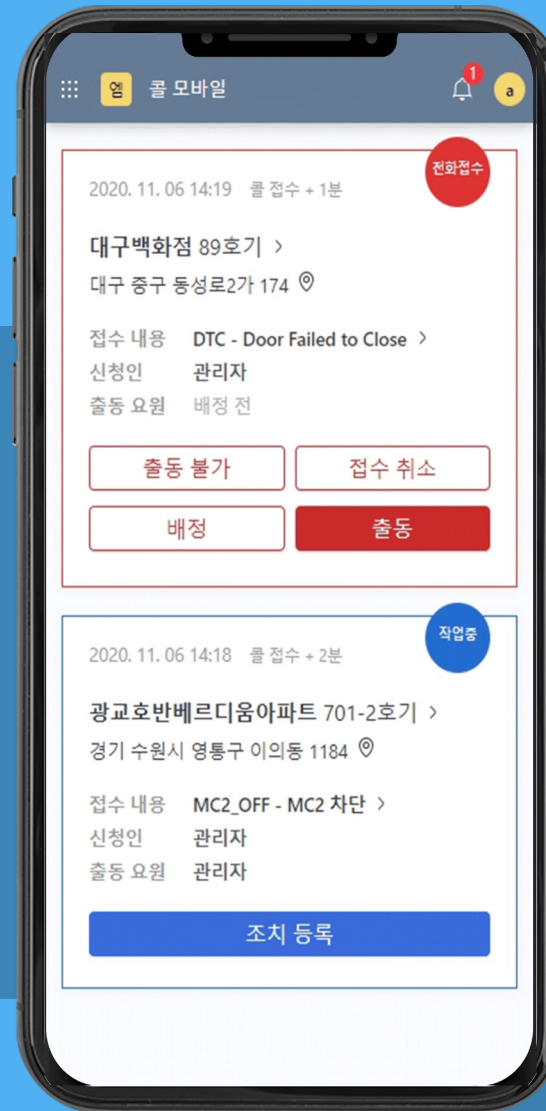
Automated Failure
Detection,
Remote Resolution, and
Real-Time Reporting



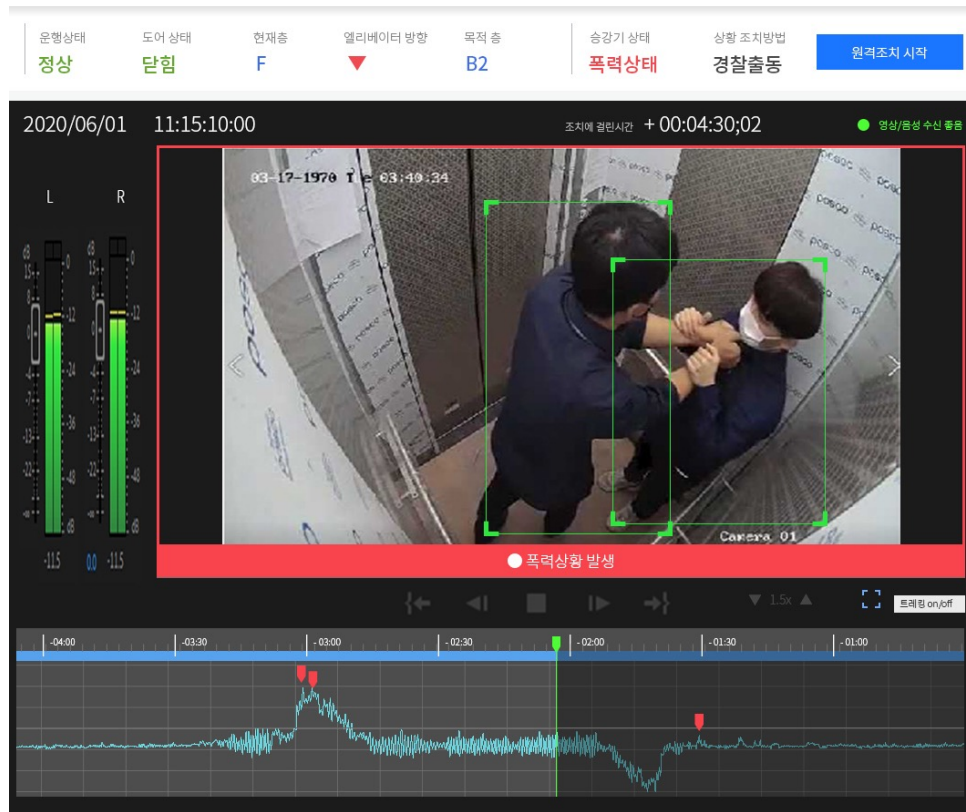
Empower Your Journey with

Real-time Alerts,
Seamless Workflow, and
Effortless Reporting

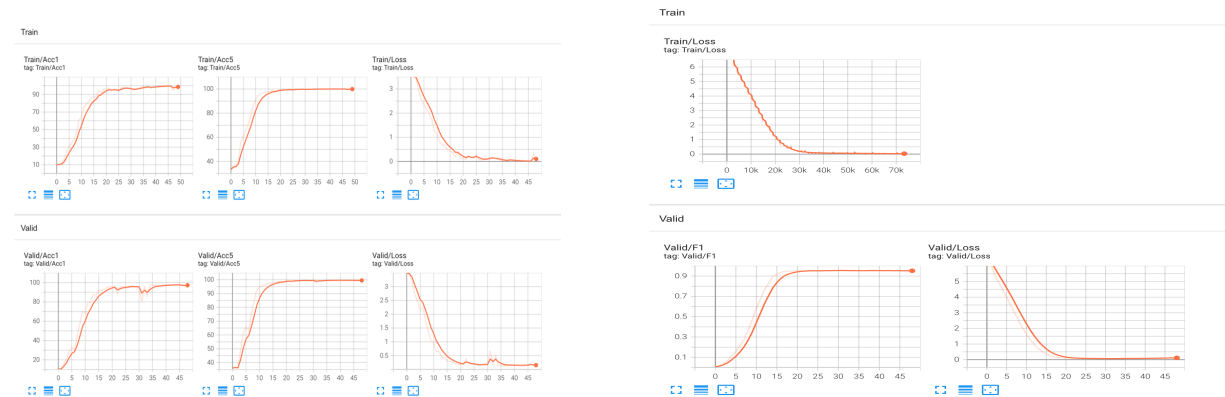
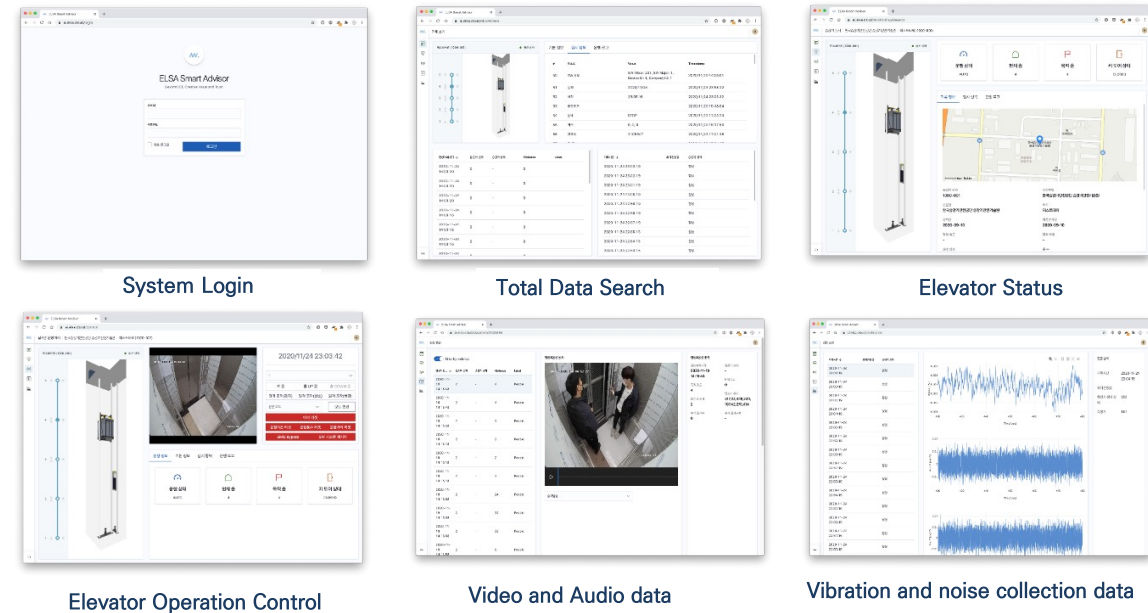
Anywhere, Anytime!



02 ELSA IoT Suite _ AIoT-based predictive model solution development / standard extension application



Development of an automatic prediction technique for elevator risk situations using smart technology



How to build a predictive model for failure parts and required materials

How to build a model that presents similar problem solutions

02

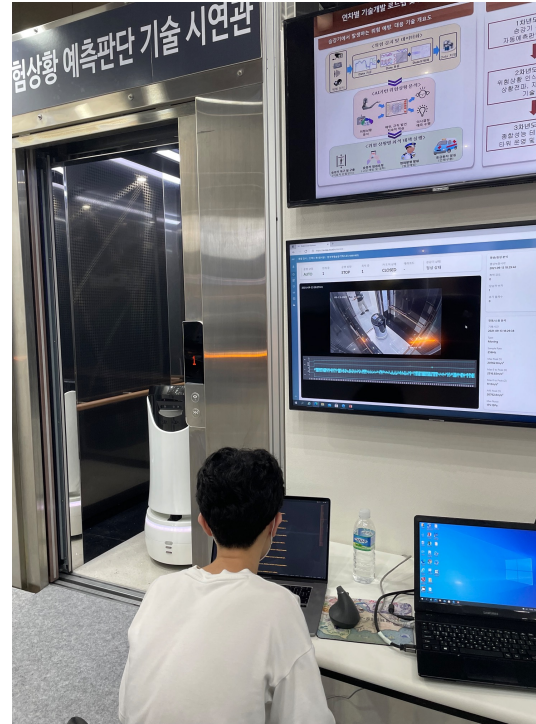
ELSA IoT Suite _Intelligent Robot Open API Services



- ▶ Korea Elevator Safety Corporation Test Tower (Geochang-gun, Gyeongnam: Elevator Specialized Base Area)
 - Design / Construction of Smart Elevator Integrated Control Platform Test Bed



KoELSA Test Tower



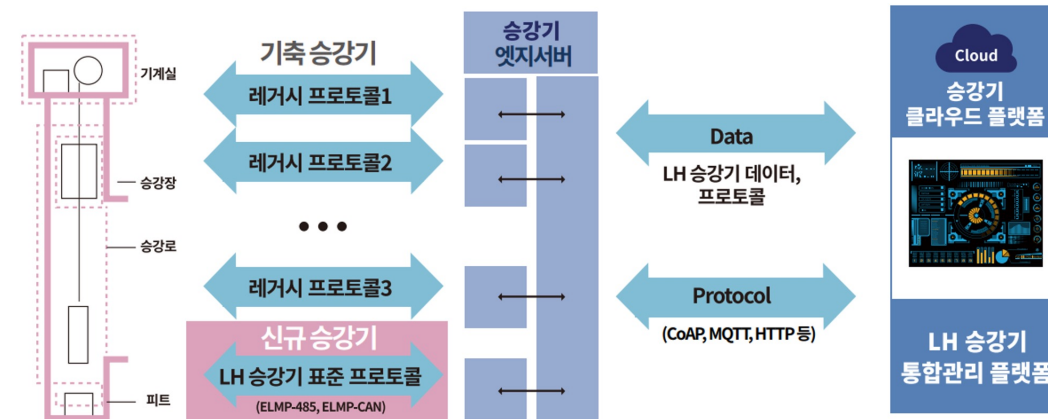
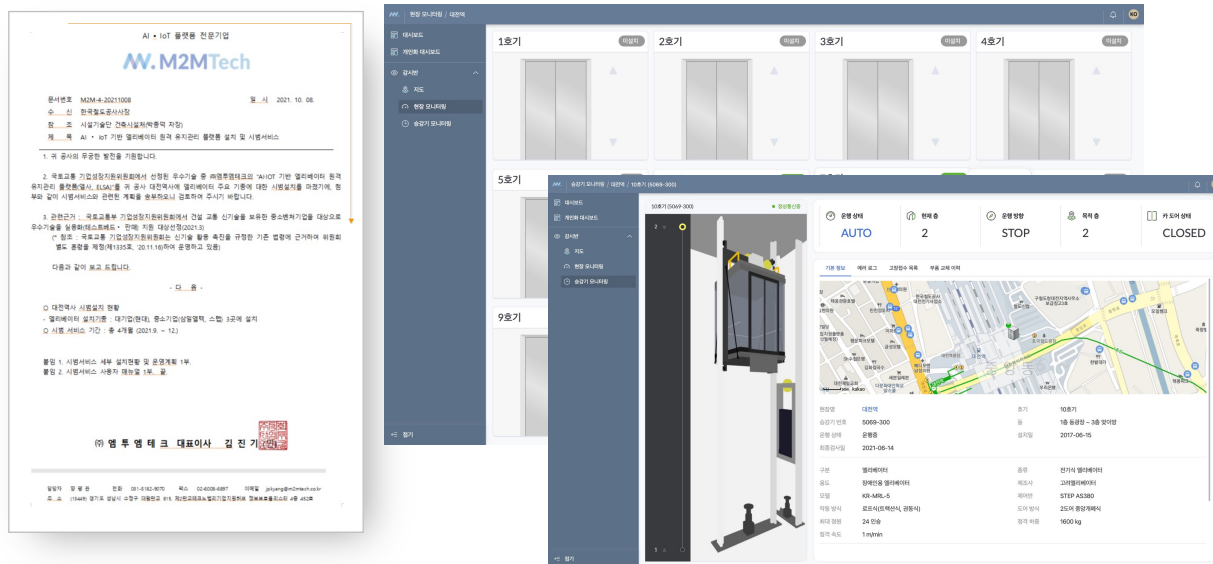
2021 International Korea Elevator Expo – AI Application Demonstration and Installation of Dangerous Situation Prediction



02 ELSA IoT Suite _ Application of KS Standards for public institution

Application of KS Standards for public institution

1. KoRail : Daejeon Station Pilot Service (Connection/Monitoring of Representative Products of Major Companies and SMEs, Daily Inspection)
 2. LH opinion collection/policy reflection: 2020, 2021, pilot service (pilot linkage of representative elevators of Major companies/SMEs)
- ➔ Standard application design for LH integrated platform management (2021, collaboration with Korea Elevator University)



03

Application Areas and Socio-economic Ripple Effect

1. Management entity (LH, SH, local government, building owner, etc.)

- Creating future smart building services such as asset management efficiency, building value increase, and robot linkage
- Reduce elevator downtime by more than 50% and improve elevator operation rate
- Manage by elevator management supervisory authority's system and establish a predictive preservation system that meets elevator safety standards

2. Elevator Industrial Ecosystem

- Strengthen elevator maintenance skills by system in visual inspection
- Provide real-time condition monitoring service 24 hours a day, 365 days a year
- Improve customer confidence by improving quality of international standards-based maintenance services
- Identify the cause of elevator failure, which reduces failure processing time by more than 50%
- Expanding the Ecosystem of New Convergence Industries in connection with smart home services and external living services in apartment complexes

3. User

- Meeting the growing demands of people's safety and convenience services
- Reducing social safety costs by preventing elevator accidents
- Laying the foundation for creating future leading services in smart homes/city such as elevator robot delivery services

Establishment of TTA standards, national standards, and international standards to revitalize the elevator industry and contribute to life safety

ELSA

Everything's Linked,
Smart and Safe to All

Thank you.



Introduction of M2M2Tech

M2M2Tech is a state-of-the-art information security, international standards-based convergence of AIoT company that leads an open and interoperable platform through ELSA*, an AIoT elevator remote maintenance solution

회 사 명	주식회사 엠투엠테크
CEO	JinKee, Kim
Foundation Date	July 17, 2014
Business Type	IoT Convergence Software Development and Supply Industry
Business Item	Manufacturing and Service Industries
Capital Stock	1,029 million won
Employee	20
Contact	031-751-9070
Headquarters	533 and 534 Ivy Valley, 686 Cheonggye-ro, Sujeong-gu, Seongnam-si, Gyeonggi-do
Branch	669, Geoan-ro, Mari-myeon, Geochang-gun, Gyeongsangnam-do
Home Page	www.m2mtech.co.kr

M2M2Tech Equity Structure (March, 2023)



ELS A : Elevator Smart Advisor / Everything's Linked, Smart and Safe to All

AIoT(Artificial Intelligence of Things) : The totality of the technology and capabilities and industry required to collect data to solve a problem or achieve a goal, develop artificial intelligence, mount, fuse, and utilize it in objects

Major History

