Robot Friendly Asset Promotion Association

Introduction of Robot Friendly Asset Promotion Association (RFA)

Rev.1.2

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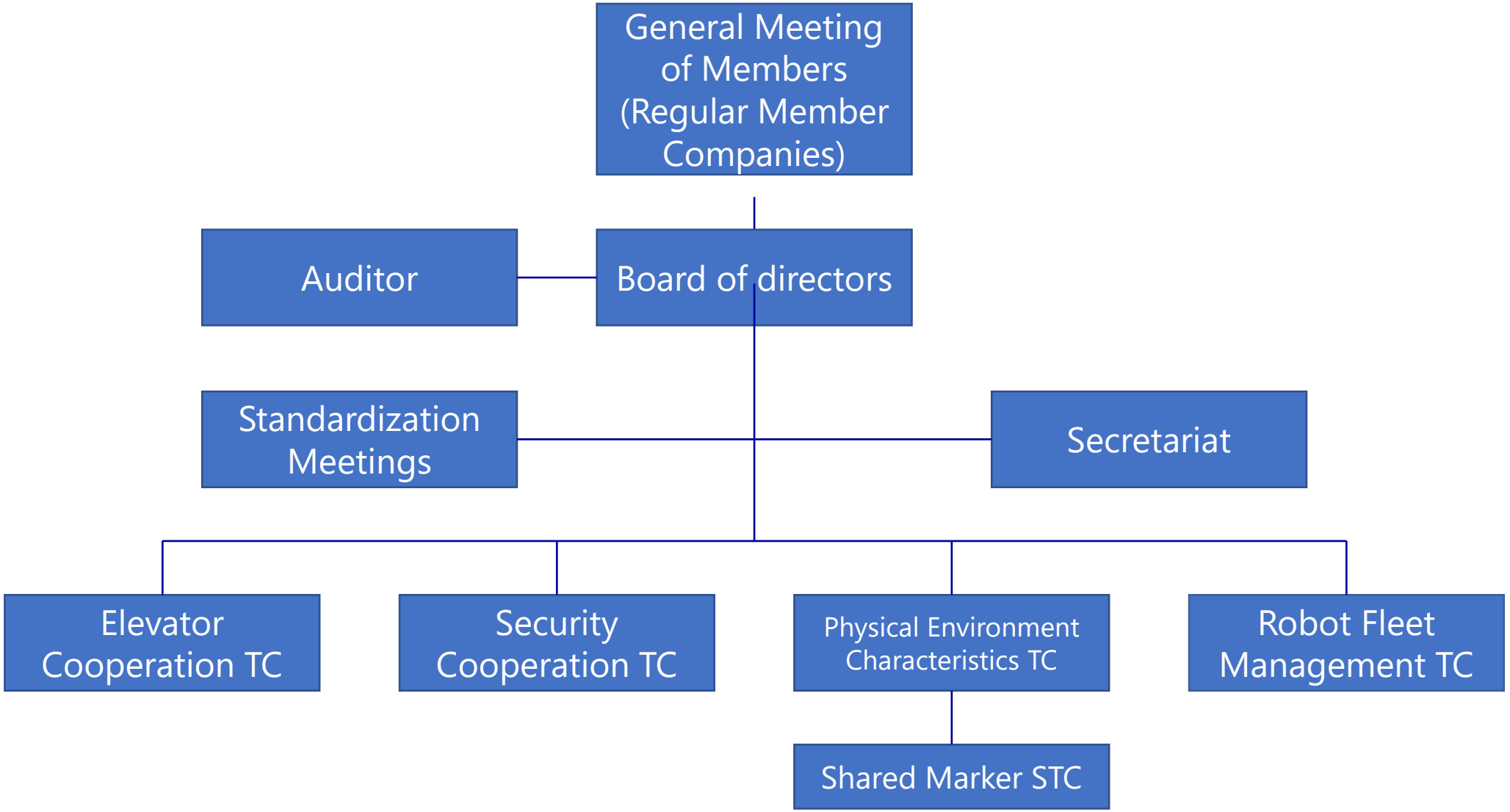
Overview

RFA	Robot Friendly Asset Promotion Association (General Incorporated Association)
HP	https://robot-friendly.org
Email	rfa@supportoffice.jp
Establishment date	August 10, 2022
Inauguration date	September 2, 2022
Address	#507 Kikai Shinko Kaikan 3-5-8 Shiba-koen, Minato-ku, Tokyo
Representative Director	Tsutomu Wakitani (American Honda Motor Co., Inc. Solution system, R&D Business unit, Vice President, Executive Chief Engineer)
Purpose	Supporting the creation of a robot-friendly environment to enable the widespread use of robots in all types of facilities
Activity	(1) In order to collaborate between facilities and robots, organize and solve issues that companies should cooperate with, and then create an environment where each company can focus on competitive areas. (2) Definition of a robot-friendly environment in facilities (3) Collecting and disseminating information on robot-friendly environments (4) Other activities necessary to achieve the above objectives
Logo	RFA Robot Friendly Asset Promotion Association

Organization chart

RFA is building a robot-friendly environment in four areas.



History

In order to collaborate between facilities and robots, RFA is organizing and solving issues that companies should cooperate with.

2019	The Ministry of Economy, Trade and Industry (METI) and NEDO launched the **“Robot Implementation Model Construction Promotion Task Force (TF)''** to consider the use of robots to solve labor shortages.
2020	The TF was transferred to the Robot Revolution and Industrial IoT Initiative Council (RRI), which was established based on the new robot strategy. **Facility management TC** was established within the TF to consider standards for cooperation between robots and elevators.
2021	Facility management TC has published the **"Robot-Elevator Cooperation Interface Definition (Draft)"** which indicates the areas and technical specifications that should be standardized in cooperation between robots and elevators.
2022	Facility management TC launched the “Security Collaboration Sub TC" to consider standards for collaboration between robots and facility doors, etc. The Facility Management TC within RRI was progressively dissolved and **“Robot Friendly Asset Promotion Association (RFA)”** was established.
2023	In addition to the **``Elevator Coordination TC''** and **``Security Coordination TC’’**, RFA has newly launched **``Physical Environment Characteristics TC''** and **``Robot Fleet Management TC,''** resulting in a 4TC system.

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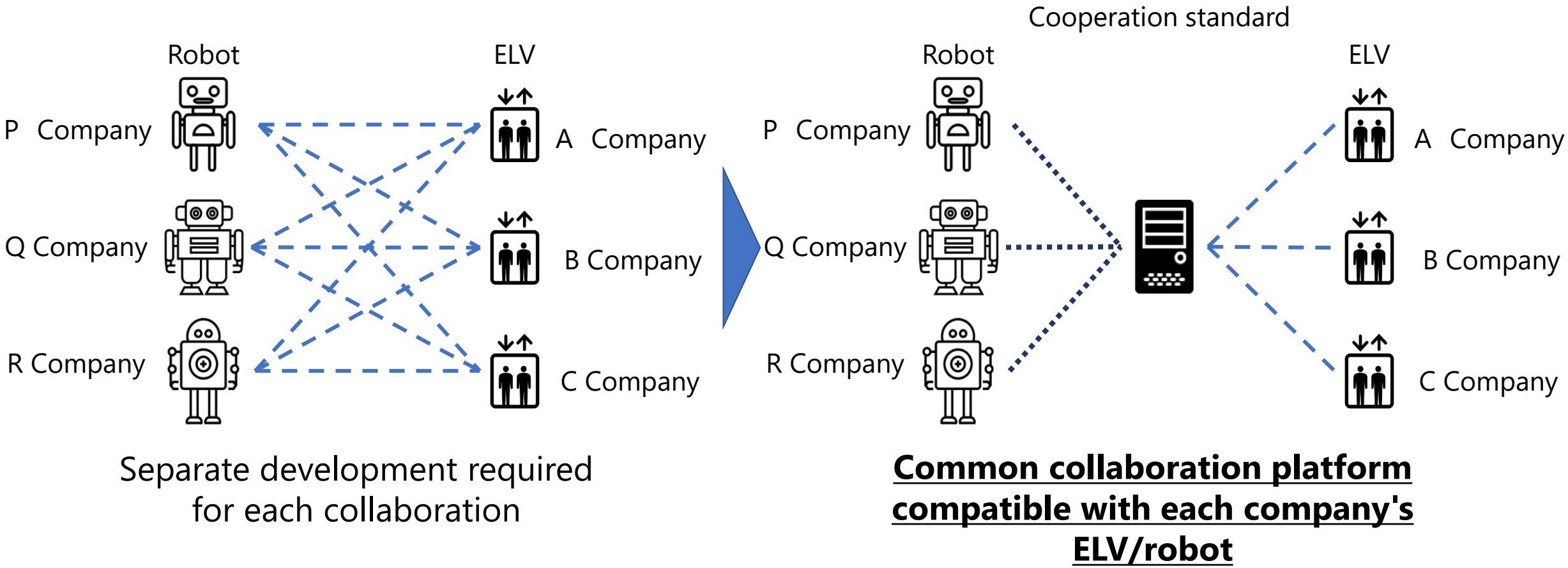
Four TCs Overview

RFA is building a robot-friendly environment in four areas.

Elevator Cooperation TC	• Publication of a manual that enables easy and stable introduction and operation of robot x elevator cooperation system • Brush up on robot x elevator collaboration standards • Activities to promote the practical application of robot business using a robot x elevator collaboration system
Security Cooperation TC	• Publication of a standard for cooperation between robots and security system • Publication of a guideline to enable easy and stable introduction of robot x security cooperation system
Physical Environment Characteristics TC	• Investigate and compile the physical environment and related regulations of various facilities. • Based on the above, quantitatively define the "robot-friendly environment level" and publish standards/manuals.
Robot Fleet Management TC	• Achieving the operation of multiple robots of multiple types within the same facility (specifically, enabling robots to pass each other) • In order to achieve the above, specifications for communication/operation must be developed and standardized/manualized.

2-1. Activities of Elevator Cooperation TC

A standard was published to enable robots to cooperate with elevators and provide services using vertical movement.

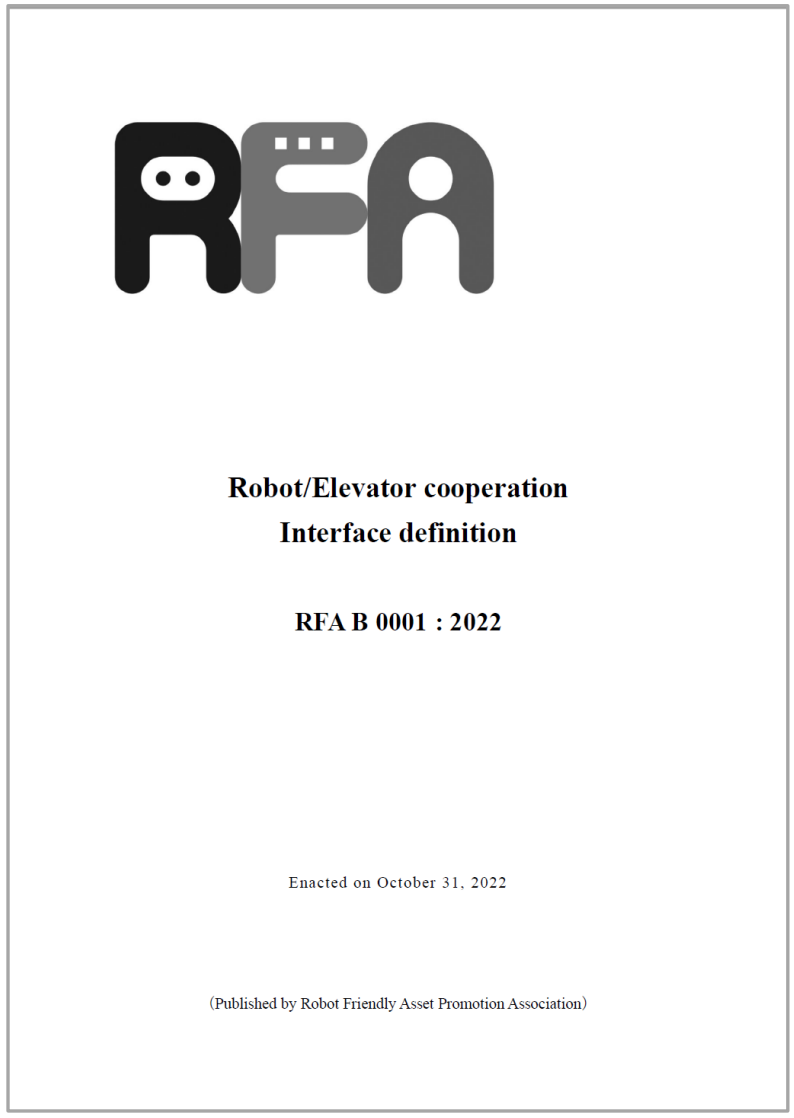


Separate development required for each collaboration

Common collaboration platform compatible with each company's ELV/robot

Robot/Elevator cooperation Interface definition (RFA B 0001 : 2022)

RFA have created a communication standard between robot servers and elevator servers, and the Japanese and English versions of the standard are currently on sale.

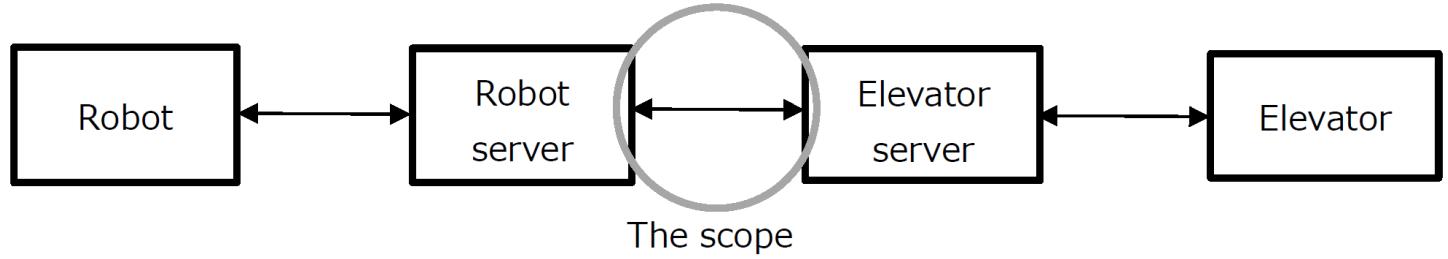


Robot/Elevator cooperation
Interface definition

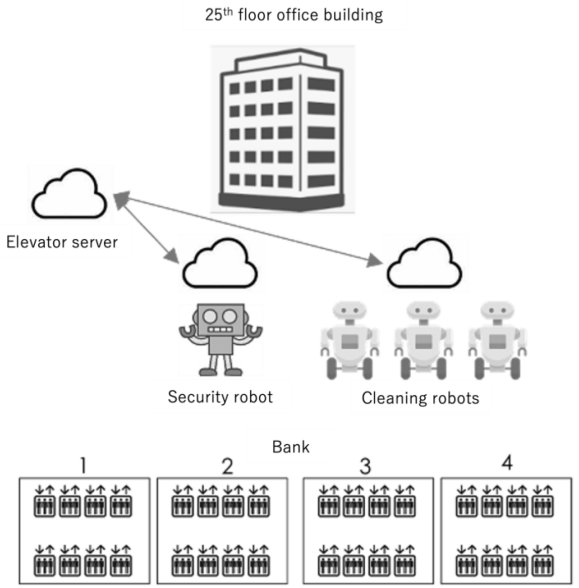
RFA B 0001 : 2022

Enacted on October 31, 2022

(Published by Robot Friendly Asset Promotion Association)



Example of standard use case



Location	Office building (25 floors)
Number of banks	4 (low-rise, middle-low-rise, middle-high-rise and high-rise)
Number of cages	8 cages/1 bank
Number of cages for robot	1 cage per 1 bank, fixing one specific cage, leaving the group management
Robot types	2 types (security and cleaning; autonomous operation is prerequisite)
Number of robots	4 robots (1 security robot and 3 cleaning robots)
Robot operating time	Time when people's traffic is not concentrated. (Avoid rush hours, but when general visitors are present)
Others	➢ Users and robots get on together. ➢ There is a case that two robots request one cage at the same time. ➢ Only one robot can get on one cage. ➢ Assuming that the radio waves in the building and the cage may be interrupted. ➢ Modification of existing elevators in existing buildings ➢ Assuming that the elevators may be normally used by general visitors. ➢ Considering emergencies

This year's activities of elevator cooperation TC

Supporting use case creation while utilizing already published collaboration standards

Background

- Although the standard for communication between robots and elevators has been established, implementation examples are yet to be developed.
- When a person in charge actually wants to introduce a collaboration system, it is complicated because there are many people involved, and there is often no one to lead the way.
- In many cases, the person in charge is not accustomed to operating robots, and it is often unclear how to utilize the system even though the system has been introduced.

Target

Supporting the smooth introduction/operation of a robot x elevator collaboration system

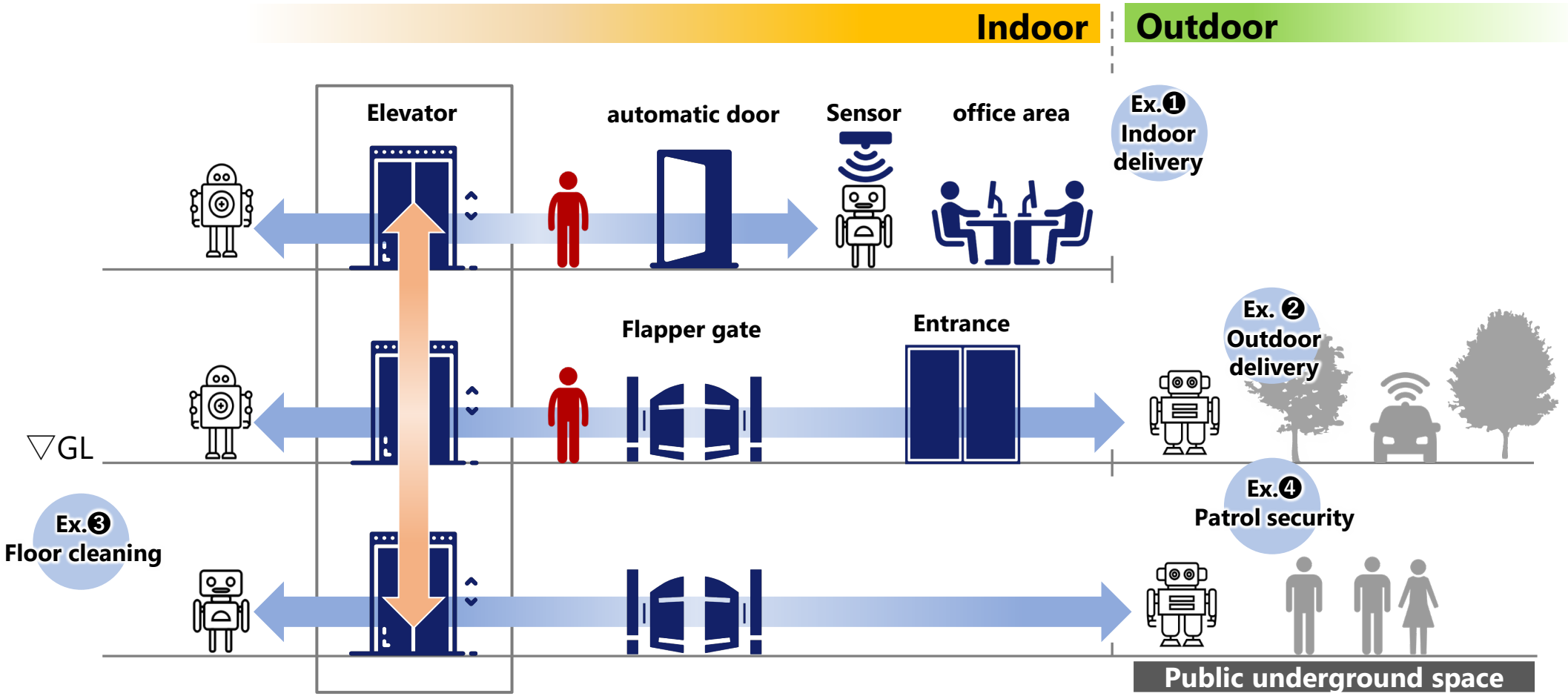
Activities

① Publication of a manual that enables easy and stable introduction and operation of robot x elevator cooperation system
② Brush up on robot x elevator collaboration standards
③ Promote the practical application of robot business using a robot x elevator collaboration system

2-2. Activities of Security Cooperation TC

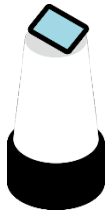
Publish standards for robots to provide surface services while cooperating with access control systems/doors/flapper gates, etc.

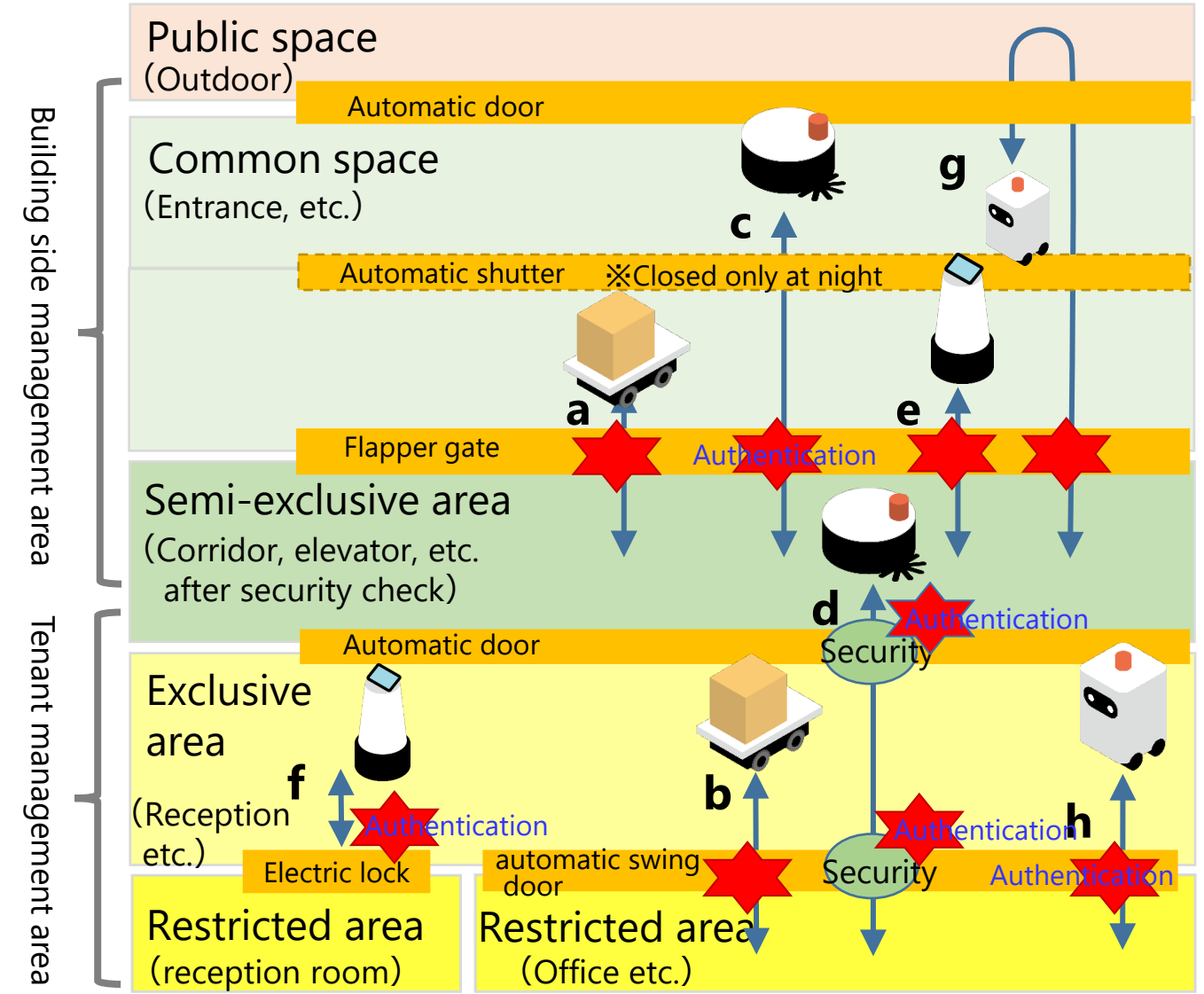
Cooperation between robots and security systems



Example of standard use case

It is assumed that a wide variety of robots will provide services while moving back and forth between each security area.

No	Robot type	Operation
a	Delivery 	Receive parcels at the building entrance➡Delivery to common area delivery company entrance
b		Pick up at the exclusive entrance➡Delivery to the person in charge in the restricted area
c	Cleaning 	Cleaning robots regularly clean buildings and common areas
d		After the unmanned semi-exclusive area is cleared of security, the cleaning robot performs regular cleaning.
e	Guide 	Visitors register with a guide robot at the building entrance. ➡ The guide robot will escort visitors to the entrance of the company they are visiting.
f		Visitors register at the entrance of the visiting company ➡ The guide robot will escort the visitor to the reception room.
g	Security 	Security robots regularly patrol the perimeter of the building and common areas within the building.
h		Security robots regularly patrol exclusive areas and restricted areas



This year's activities of security cooperation TC

Security cooperation TC publishes a standard/guideline.

Background

- Since robot services are limited to areas where robots can move, the incorporation of robots into work is not widespread.
- Increasing number of scenes where robots can play an active role, such as non-contact services
- Individual modifications are required for each robot/building equipment/service, which tends to increase development costs/product prices.

Target

Support for collaboration between robots and security (access control systems, doors, flapper gates, etc.)

Activities

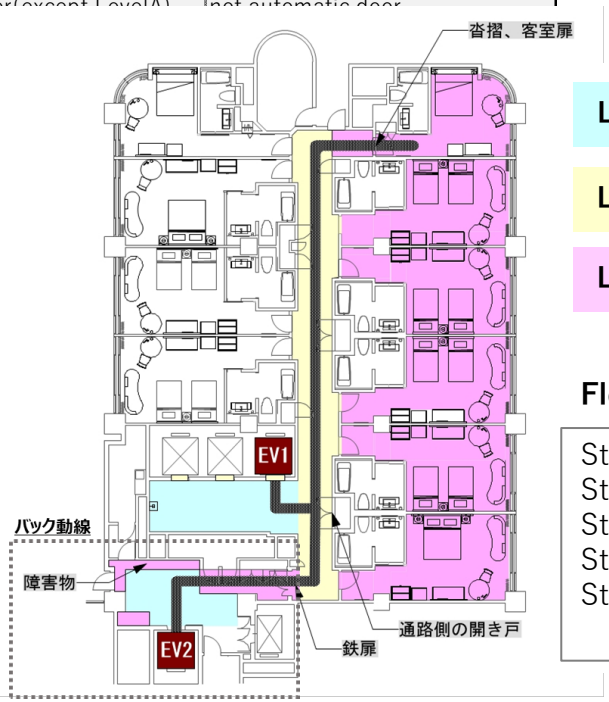
① Publication of a **standard** for cooperation between robots and security system

② Publication of a **guideline** to enable easy and stable introduction of robot x security cooperation system

2-3. Activities of Physical Environment Characteristics TC

Quantification of robot friendly level (sample image)

Field	Level A	Level B	Level C
Slope	0	1/12 or under	over 1/12
Step	0	5mm or under	over 5mm
Gap	width:10mm or under	width: from 10mm to 20mm or depth: 5mm or under	width:over 20mm and depth:over 5mm
Aisle width	1.2m or over	from 0.8m to 1.2m	under 0.8m
Entrance width	1.2m or over	from 0.8m to 1.2m	under 0.8m
Elevator size	The size that the robot can turn ar	1.35m or over	under 1.35m
Door	automatic door that keep opening	automatic doo	not automatic door
Slipperiness of the floor	CSR: 0.4 or over	CSR: under 0.	
Fliction of the floor	not high-pile carpet	high-pile carp	
Ceiling	N/A	N/A	
Wall	N/A	N/A	
Sunlight	no direct sunlight	no direct sunl	
Illuminance	1lx or over on marker	N/A	
Network	cover the entire area	cover the spot	
Obstacles	none	recognizable and there is avoid	



Level A Regardless of the purpose, most robots can move.

Level B Most robots can move, but not for some applications.

Level C Performance requirements for robots are strict, and inexpensive robots cannot move.

Flow image from level identification to robot introduction

Step1: Decide on the application of the robot.
Step2: Determine the area or route where you want the robot to move.
Step3: Rate the robot friendly level of the area or route you have decided.
Step4: Select a robot that is suitable for the application and level.
Step5: By converting the physical environment side to robot friendly, you can select robots with a lower level of robot friendly revel.

Project Report to Construct a Basis for Research and Development of Innovative Robots(March 2022)

Benefits of standardizing physical environment characteristics

Create the standard that defines environments in which robots can easily run (robot-friendly environments) and encourage the introduction of robots by utilizing the standard.

	Problems	Benefits
Robot Maker	It is difficult to have a common understanding regarding facility design, and general specifications cannot be set : • It takes time to understand the situation before introducing robots. • When introducing robots, it takes time and money to customize them according to the situation of each facility.	Having standards and guidelines related to the physical environment will help develop general-purpose specifications. • Reduces time spent on assessment and customization before and during deployment. • Reduces development and integration costs.
User (e.g. Real estate developer)	There are no standards that can be referenced to create a robot friendly environment : • Because users do not know how to make the environment robot friendly and how much it will cost before introducing it, they are not making progress in improving the environment. • Customization costs were higher than expected during implementation and the expected ROI could not be achieved. • Implementation takes time and does not proceed according to the expected schedule.	Standards and guidelines regarding the physical environment will be developed, and methods for making the environment robot-friendly will be available for reference, making it possible to understand the time and cost of introducing robots. • Easier to calculate ROI and progress in considering implementation. • The implementation will proceed according to the expected ROI and schedule, and it will be possible to expand horizontally and apply it to newly constructed properties.

This year's activities of Physical environment characteristics TC

Physical environment characteristics TC publishes a standard/manual.

Background

- Currently, vendors are only introducing robots to facilities where the specifications developed by each company are applicable.
- By standardizing the physical environment characteristics of facilities, we will break away from the above current situation and realize a situation where we can gain economies of scale.

Target

Define physical environment characteristic levels and issue a standard

Activities

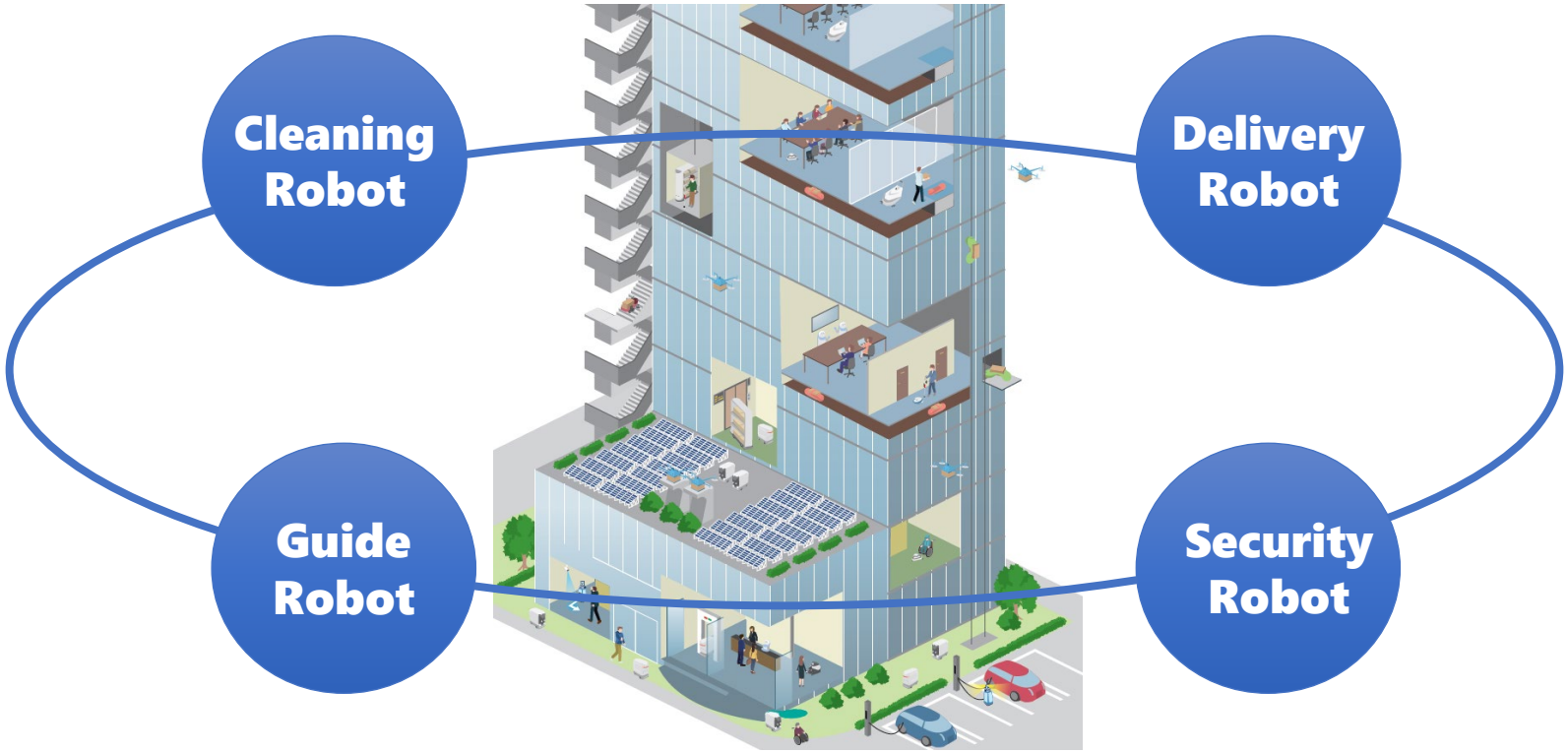
① Publication of a standard for physical environment characteristic levels
② Discussion on shared markers used for self-location recognition
③ Appeal for standardization of physical environment characteristics levels

2-4. Activities of Robot Fleet Management TC

Building a system that allows multiple types of robots to move within one facility

Issues to consider

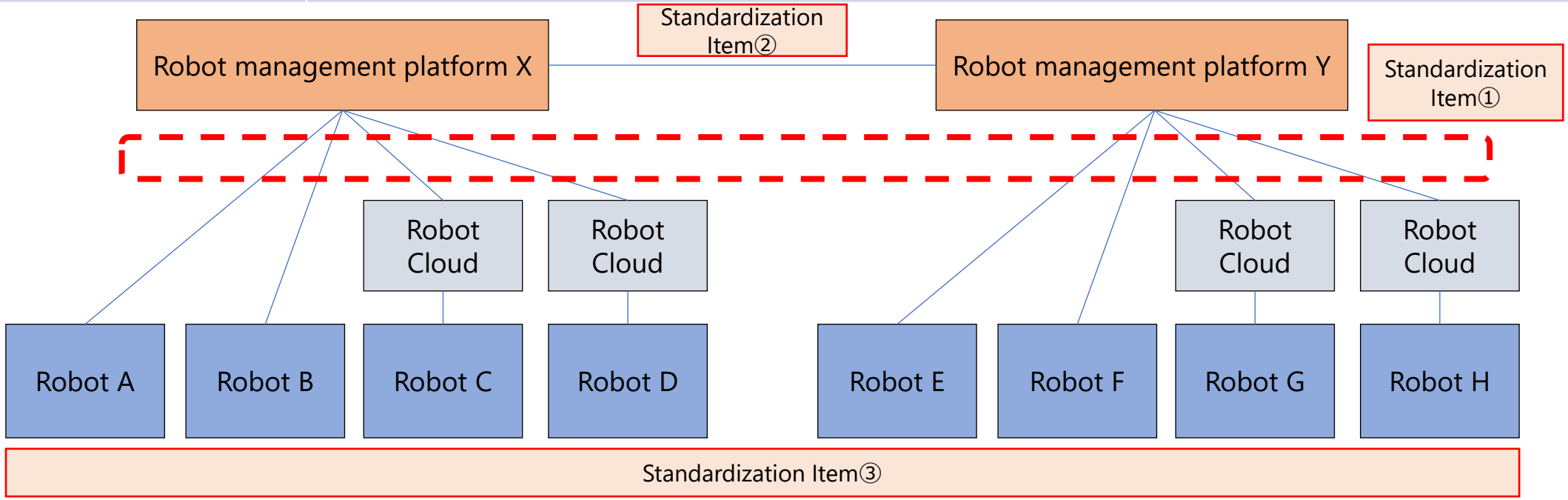
- Congestion or impassability on the route (robots stuck together)
- Congestion in the elevator hall (cannot get on and off) and congestion when passing through the security gate
- Congestion at waiting and evacuation areas



Items to consider in robot fleet management

Consider the possibility of standardization in the following three items.

Items	Goal image
①Standard robot control implementation	Multiple robot platform management platforms provide standard control over robots (Robot standby control, evacuation control, etc.)
②Information coordination between robot platforms	Standardize the method of information coordination (robot position information, status, etc.) between robot management platforms. (This collaboration is required when robot management PFs coexist in a facility.)
③Standardization of robot operation rules	Standardize robot behavior/operation (e.g., robots driving on the left)



Robot Fleet Management TC activities over the next two years

Robot Fleet Management TC publishes a standard/manual.

Background

- If robots meet each other in a narrow passageway, a deadlock will occur (robots cannot resolve the situation and human assistance is required)
- The more human help is required, the higher the operational hurdles become, reducing the incentive to continue using robots.

Target

Creating an environment where robots can pass each other and multiple robots of multiple types can operate within a single facility.

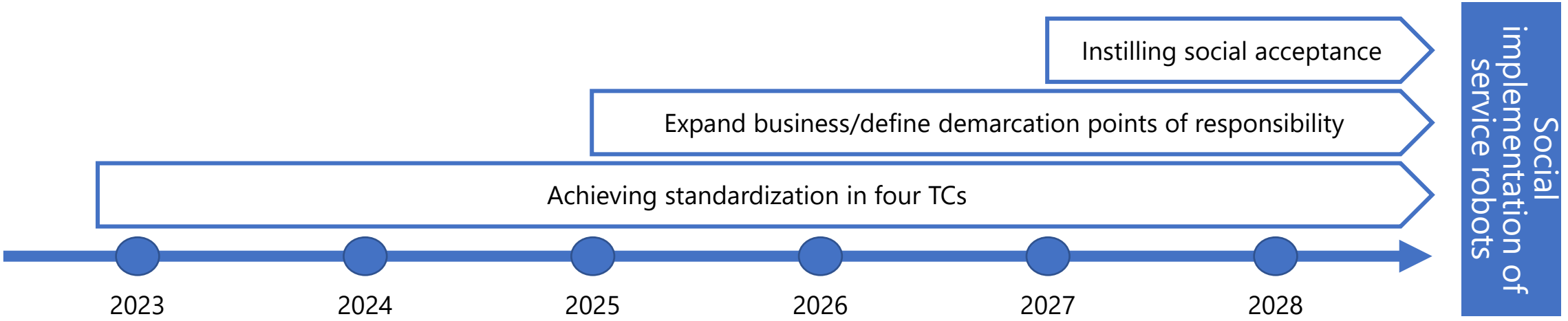
Activities

① Publishing a **standard** for communication specifications to enable robots to pass each other
② Publishing a **manual** for operations to enable robots passing each other

2-5. Medium-Term Action Plan

RFA will address the following three cross-cutting issues :

Business	• Currently, it is not cost-effective to modify facilities and equipment for one robot/service. • There is a need to reduce the cost of each service by sharing facilities and equipment between multiple types of robots/services. • Cross-sectional collaboration is important in terms of services, data, infrastructure, etc., both indoors and outdoors.
Demarcation points of responsibility	• Occurs in an environment where one robot is shared or multiple robots coexist. • Ownership: Who owns the robot, who will bear the cost of renovating the facility (whose assets will it be recorded in)? • Operation: Who will provide guarantee when trouble occurs with shared robots/equipment?
Social acceptance	• Service robots aren't perfect, but neither are human services. • Creating an atmosphere where imperfect robots and humans can coexist by dividing up and collaborating on services.

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