NTT DATA

Strategic Innovation Program (SIP)/3rd Phase: Development of Smart Mobility Platform

“Realization of a Smart Mobility Society using the Japan Mobility Data Space”

Report on achievements

April 26, 2024
NTT DATA Japan Corporation
Social Infrastructure Solutions Division
Social Innovation Division

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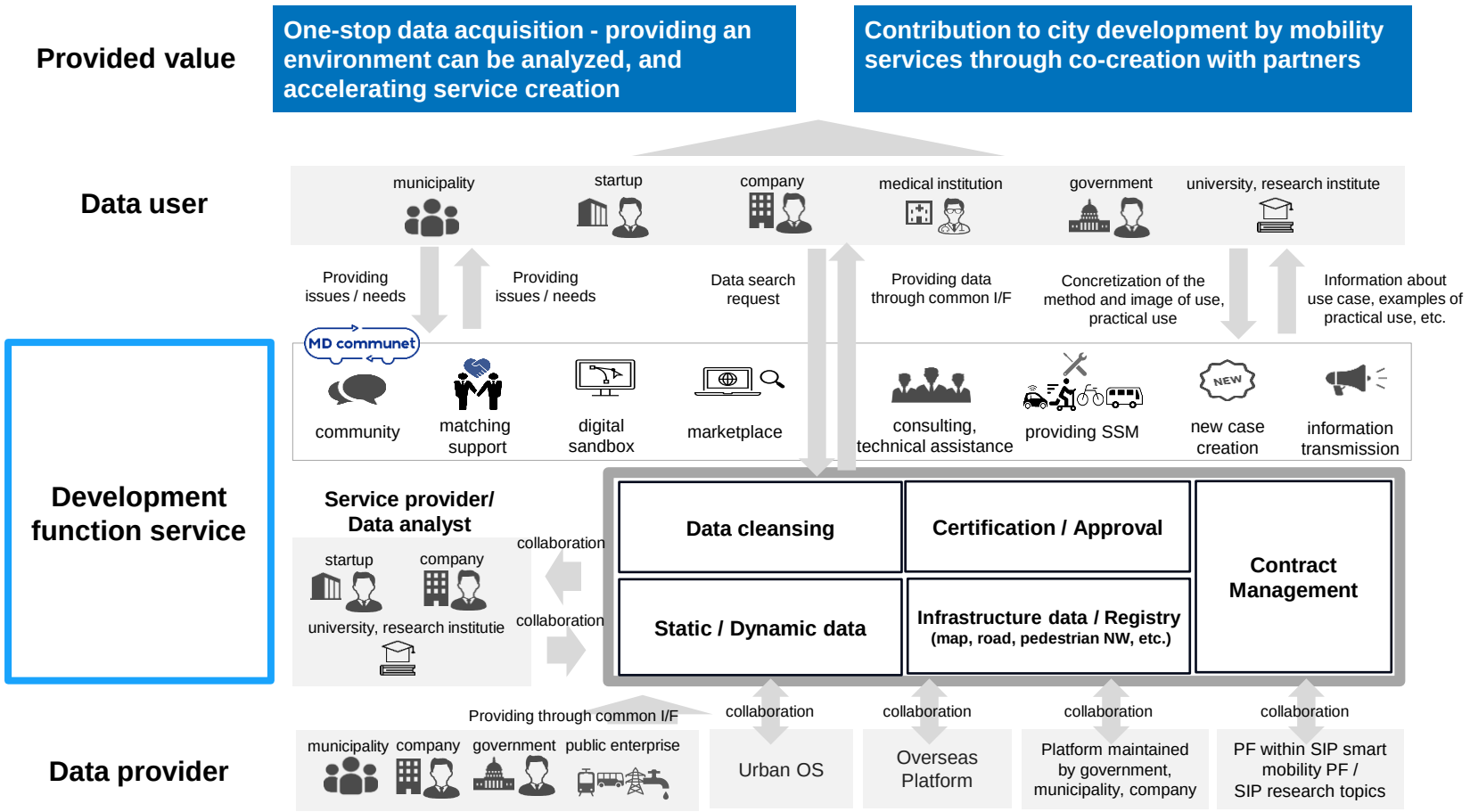
Project Outline

(1) Aim of the project

- The project aims to build and implement **“Japan Mobility Data Space”, which is a core distributed federal data linking platform system** for **connecting services and people** who make use of data **through linkage of data distributed and managed by region, by area, and by platform**, to realize a **society without a mobility divide** where people, goods, and services can move freely and independently, safely, comfortably, environment-friendly, people-friendly, and city-friendly.



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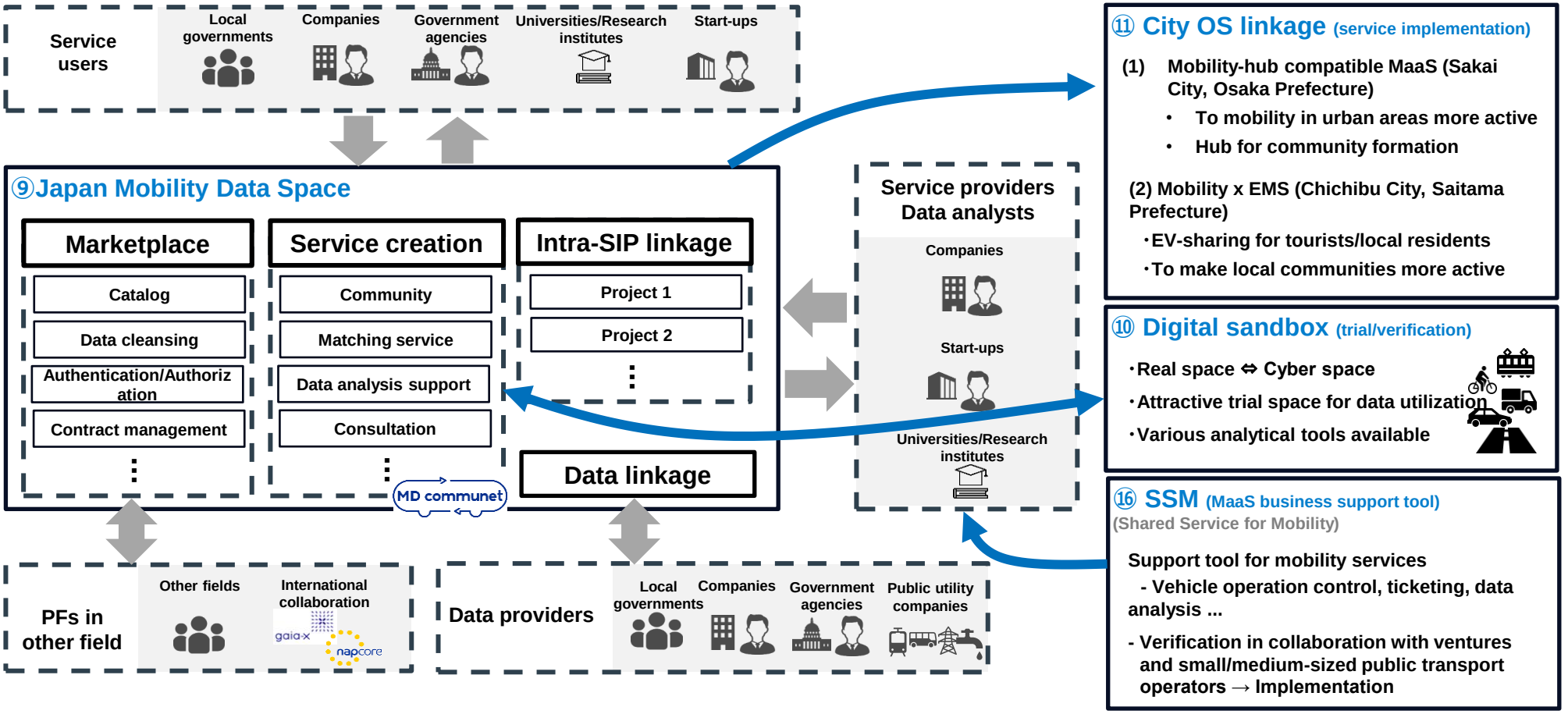
(2) Overview and structure of the project

- The project is designed to promote the creation of diverse mobility services through (Theme ⑩) Simulations by making use of a data platform, (Theme ⑪) Various sorts of services linked with City OS, and (Theme ⑯) SSM construction/implementation, setting “Japan Mobility Data Space” (Theme ⑨) as the focal point.



FY2023: Establishment of specifications, FY2024: Construction, FY2025: Demonstration, evaluation, and improvement
→ We make improvements for it, listening to real voices for service provision and social implementation from FY2026.

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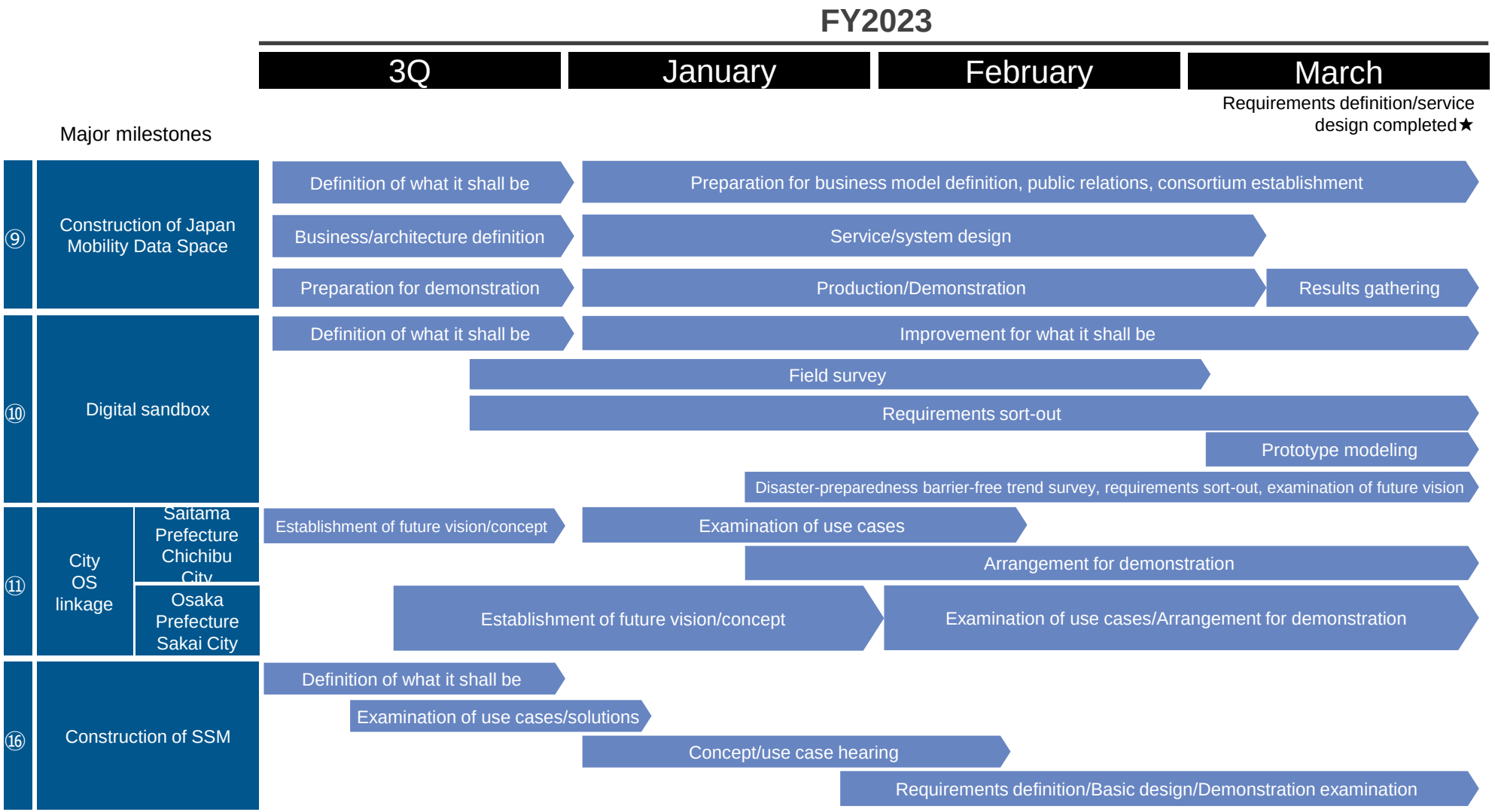
(3) Overall project schedule

■ The schedule for the project in FY2023 is as follows:



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Content of Implementation

2.1 Theme ⑨
Establishment and demonstration of an infrastructure for integration and mutual use of various mobility platforms and related data

2.1.1 Construction of Japan Mobility Data Space

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(1) Summary

Aim of the project

- Construction of a **distributed federated data sharing platform named "Japan Mobility Data Space,"** which is designed to link distributed data and connect people who make use of data with services to improve the quality and efficiency of mobility services and promote innovation.

Goal in FY2023

- Examine the design of Japan Mobility Data Space services and overall architecture, and prototype requirements.

Implementation items/Examination process

- **Examination of functions required for JMDS and the overall architecture**
  - The following five functions specified as the main functions of JMDS after sort-out of issues in utilizing mobility data:
    ① Data catalog that allows search of a wide variety of data between PFs
    ② Marketplace where data found can be traded seamlessly
    ③ Data association connector that links up PFs
    ④ Data conversion service required for utilizing mobility data / ⑤ Formation of a consulting community
  - Design of the overall architecture of JMDS on the assumption that the above functions are implemented
- **Technology research and demonstration of connector streaming**
  - Survey on existing technologies and use cases for ① Data catalog (metadata schemata, LLM optimization methods), and ③ Data association connector, which are technical and functional features of the construction of JMDS.
  - Demonstration on data streaming transfer using a connector with respect to the data association connector.
  - Check of the technical feasibility for the required functions. Application of the survey results (standard methods, etc.) to the design.
- **Examination of the scope of development for prototypes and details of functions**
  - Agile-style development planned with feedback inputs from JMDS and users.
  - Sort-out of expected users, required functions, challenges, etc. to implement ① Data catalog that allows inter-PF mobility data search and ② Prototype of a data storage service.

Plans/Outlooks

- We are planning to proceed with the construction with an aim to release a prototype in May 2024.
- After that, we promote the development in the agile style with feedback inputs from users who use the prototype.

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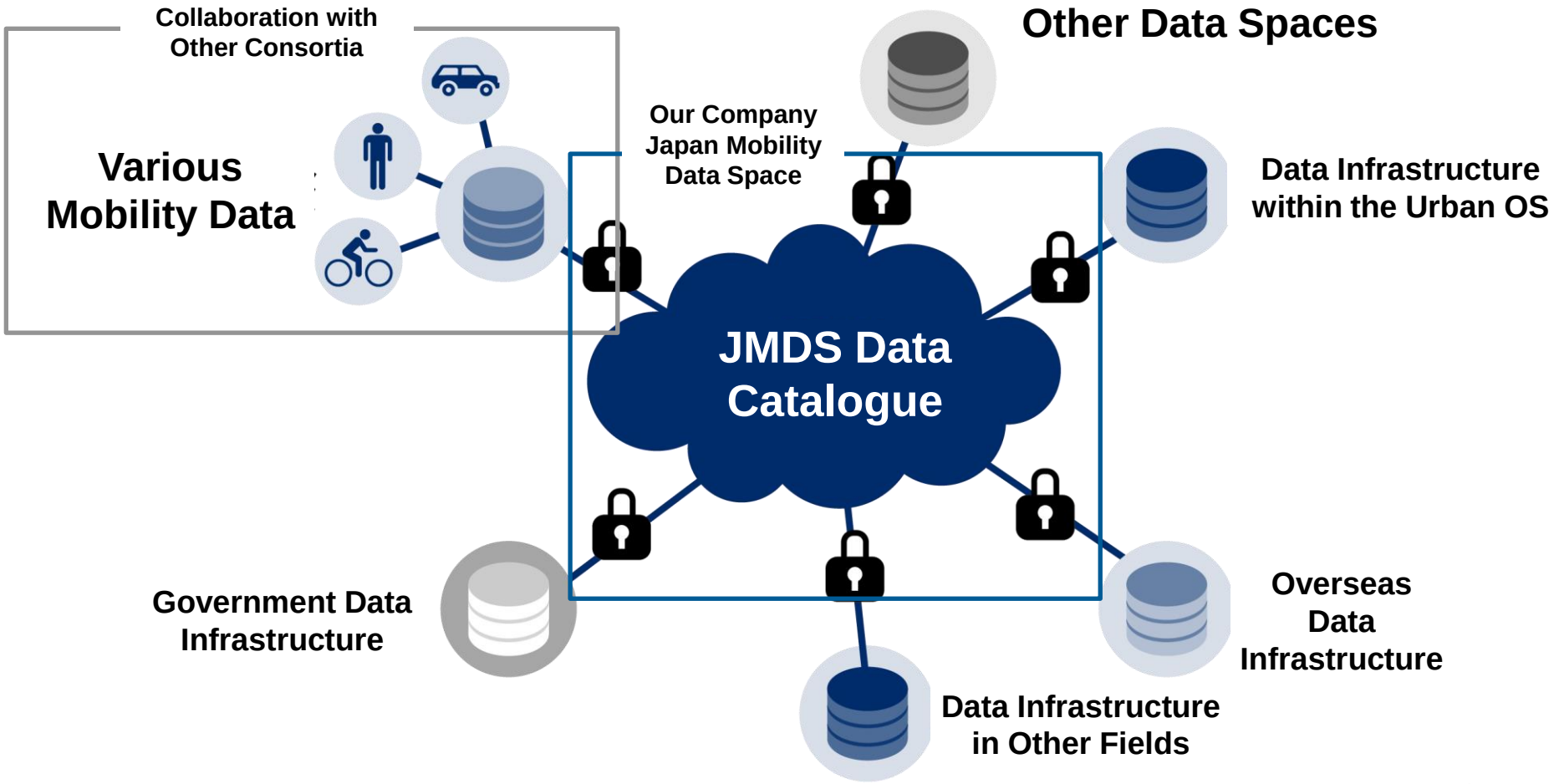
(2) Organization of the Scope of Japan Mobility Data Space Activities

- To achieve the aforementioned vision, we believe that we should promote initiatives that position various platforms and data spaces as a cross-sectional platform and function as a distributed federated hub to activate them.
- Therefore, the focus of the initiatives will be on an integrated data catalog, various functions necessary for data collaboration, a group of services required for the utilization of data, and the establishment of organizations that promote data collaboration.



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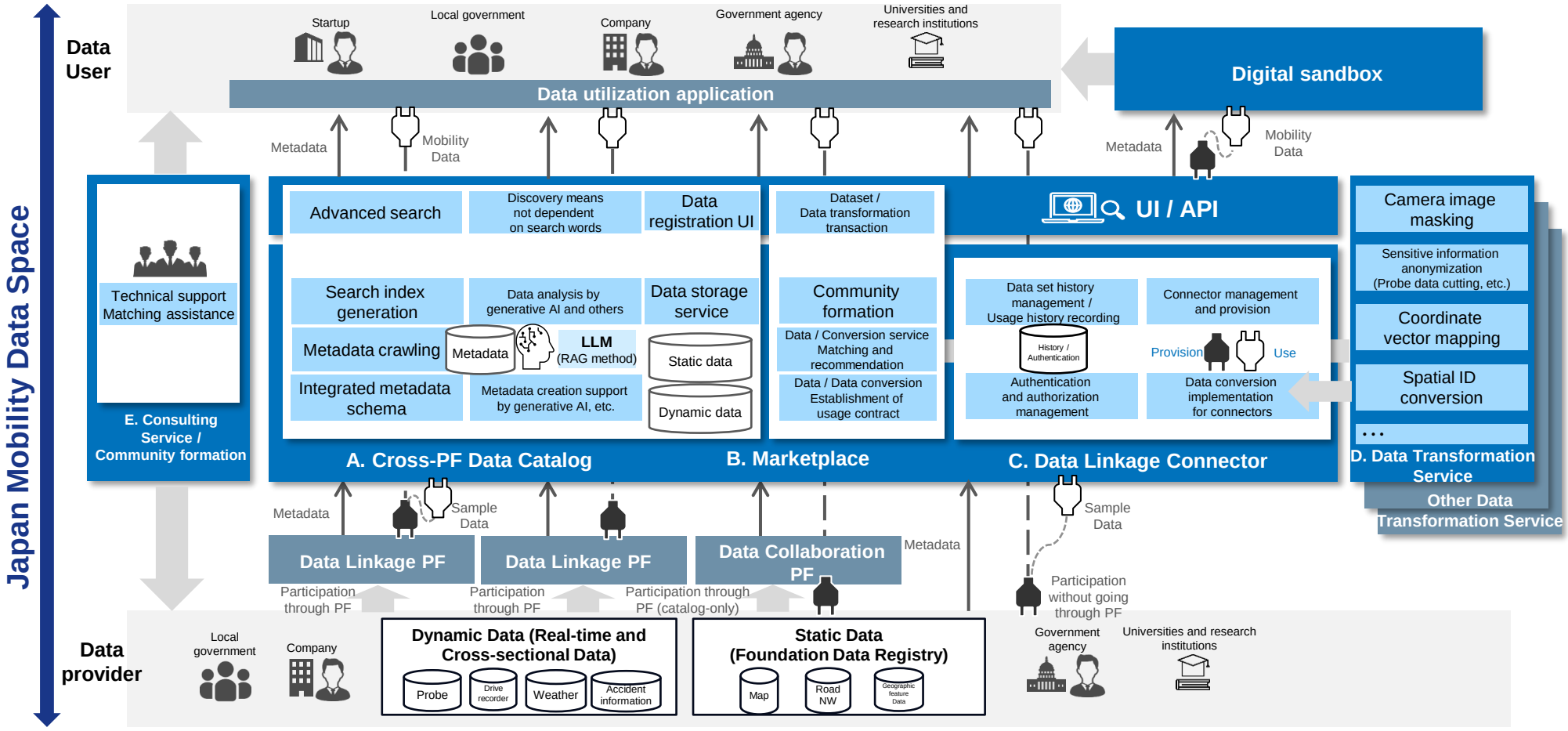
(3) Overall Architecture of Japan Mobility Data Space

- We organized the individual functional groups to be realized from the functional hypothesis and defined the architecture of JMDS as follows.



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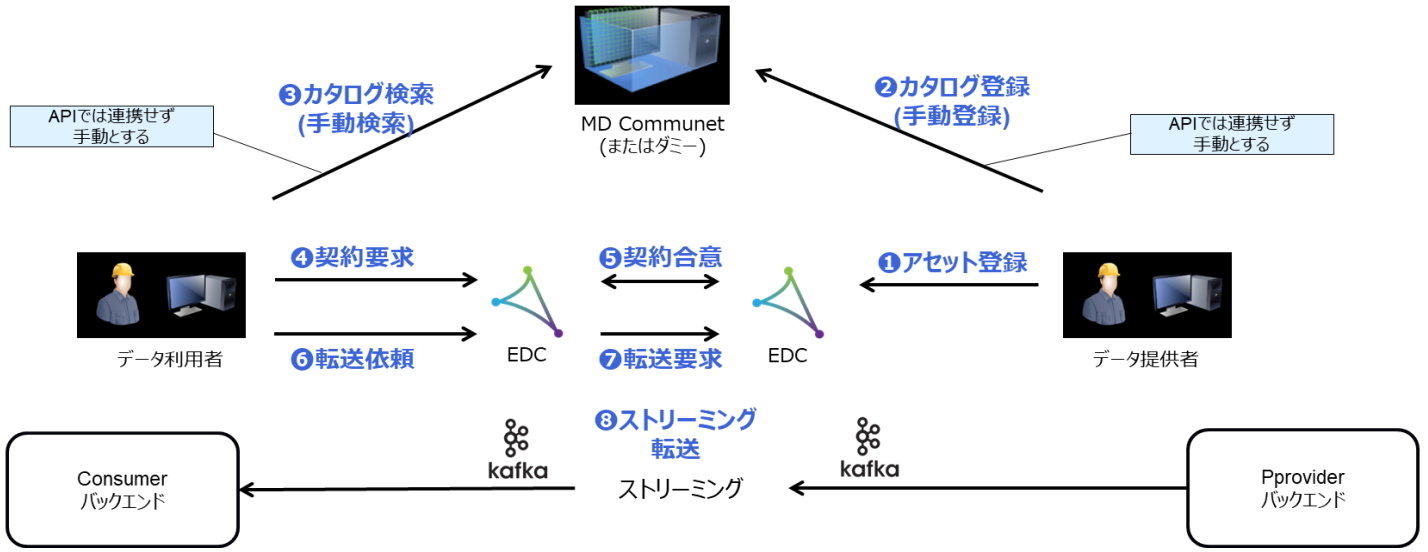
(4) Demonstration Based on Survey Results (Connector and Streaming Functions)

- Based on the survey results regarding the data linkage connector, a demonstration of data streaming transfer using the EDC (Eclipse Dataspace Connector) was conducted for the following purposes:
  - To verify the feasibility of EDC implementation at this point in time
  - To identify issues that need to be addressed for the introduction of the EDC in the Japan Mobility Data Space

Demonstration Overview



Demonstration Results

The following confirmations were made:
- The basic functions of EDC, such as asset registration for streaming and Kafka integration, can be used as they are.
- It is necessary to address technical issues, mainly concerning non-functional aspects.

Response Policy

From the perspective of the JMDS technical specifications, we will continue to collect update information on the EDC as needed and continue our considerations in the future.

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(5) Prototype Development and Provision Function Policy (May 2024)

- To verify whether the functional hypothesis is aligned with practical use, we will build and publish a prototype (scheduled for release in May 2024). We will recruit data providers and conduct functional improvements based on feedback from users.
- The prototype will offer two services: an integrated data catalog and data storage.

1. Integrated Data Catalog Service

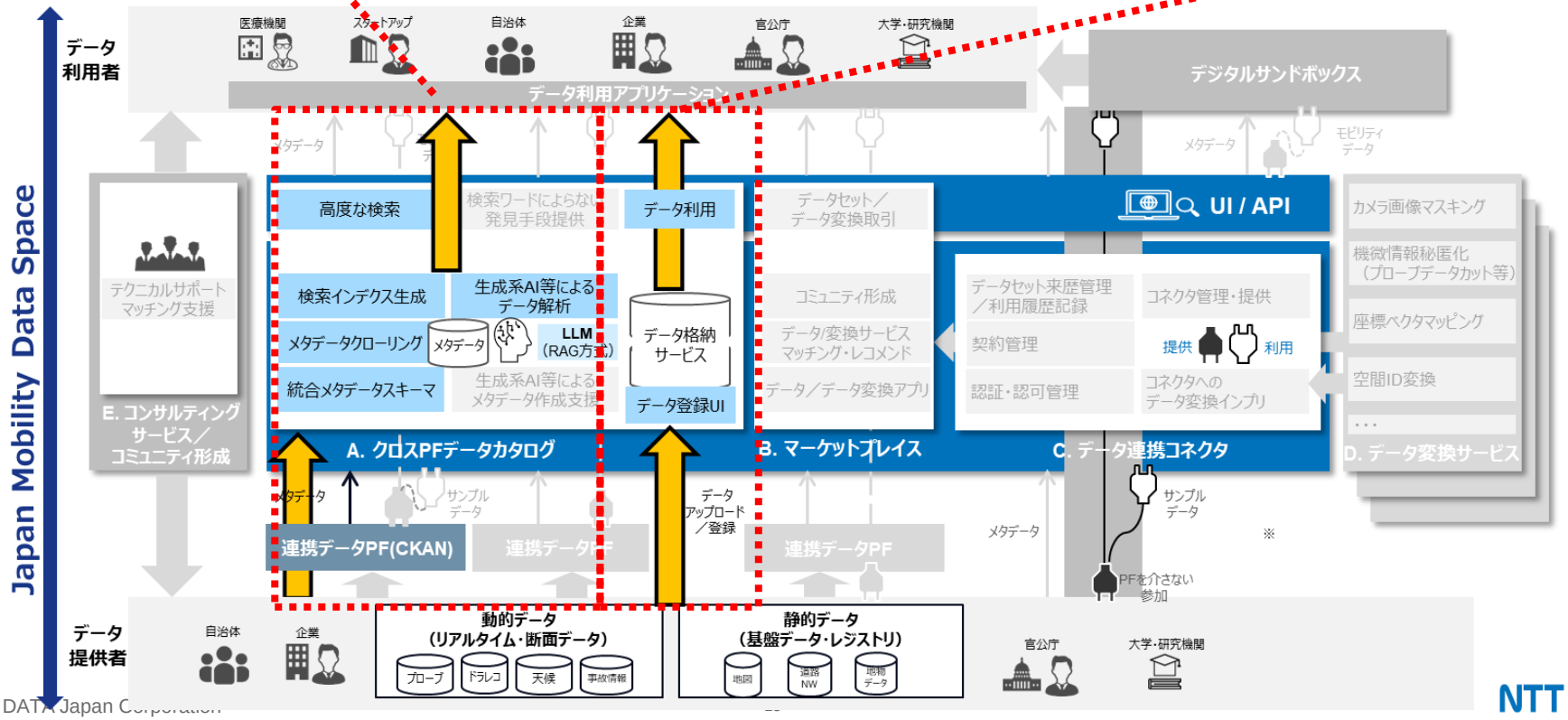
[Anticipated Users]
-JMDS and linked platform data users / Data storage service data users

[Value Proposition]
-A catalog service that allows for one-stop searching of data across multiple platforms
-Provision of interactive discovery methods

2. Data Storage Service

[Anticipated Users]
-Data holders who do not have a data platform / are not participating in a data platform

[Value Proposition]
-A data repository that allows for the sharing of data externally at low cost and with minimal resources
-Stream distribution is also anticipated



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(6) Challenges for the implementation/Actions for the next fiscal year

- Verify and evaluate the JMDS function hypothesis by ① **Early creation of utilization/application cases** of the prototype to be released in May, and implementation of functional improvements in line with practical use.
- Examine ② **Establishment of JMDS standard specifications**, including the introduction of connectors, with an eye to the stage gate in FY2025.

	Challenges for realization	Future response activities
① Early creation of utilization/application cases	More catalog-registered data	Spread and information to data holders
		Provision of catalog creation support functions
		Addition of compatible data PF
	Improvement of the accuracy of the search function	LLM tuning, selection of optimal models
② Establishment of JMDS standard specifications	Extraction of JMDS-specific requirements	Verification of the validity of API specifications, etc. from data holders and expected use cases
	Improvement of connectors from non-functional perspectives	Participation in EDC community
		Other connector implementation and continuous catch-up on usage records

Actions for the next fiscal year

✓ **Promote participation in JMDS**
- Spread the purpose and efforts of JMDS to existing data holders and respective SIP consortium contractors, aiming to register more catalog data than MD Communet.

✓ **Improve the functions of the prototype and make regular updates**
- Collect data on how the prototype is practically used and improve the search function using LLM.
- Additionally release functions that help the catalog enhanced.

✓ **Examination of JMDS standard specifications**
- Formulate JMDS standard specifications in cooperation with DSA.
- Extract JMDS-specific requirements from examples of use cases of prototype data provision and verify the validity of the standard specifications.
- Keep a close eye on connector trends globally.

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2.1 Theme ⑨
Establishment and demonstration of an infrastructure for integration and mutual use of various mobility platforms and related data

2.1.2 Promotion of the spread of Japan Mobility Data Space

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(1) Summary

Aim of the project	■ Construct a **distributed federated data sharing platform named "Japan Mobility Dataspace,"** which is designed to link distributed data and connect people who make use of data with services to improve the quality and efficiency of mobility services and promote innovation.
Goal in FY2023	■ Make a public relations plan to raise awareness of Japan The Mobility Data Space and promote participation. Examine how the consortium that will operate the organization to implement community formation with an eye toward social implementation shall be.
Implementation items/Examination process	■ **Development of JMDS public relations plans, production of a website** • Public relations planning through establishment of targets and goals for information provision and examination of effective channels (collaboration with external media, etc.) with the aim of raising awareness of JMDS and increasing interest in it. • Creation of a JMDS website and logo as a specific public relations measure. ■ **Examination of how the consortium shall be** • Establishment of a consortium consisting of related companies, experts, etc. envisioned to expand the number of JMDS users. • Identification of entities/stakeholders necessary for realizing mobility data practical use cases, and materialization of targets that participate in the consortium (data users and data providers. • Examination of how the operating entity of multiple consortia shall be (proposal), with an eye on increasing the benefits for participants, raising the feasibility of rule-making, and creating a stable operating foundation.
Plans/Outlooks	■ We will establish **the consortium's operating organization and activities**, with the aim to establish the consortium in FY2027. ■ We will establish a data manager meeting early to expand the data catalog and **promote inter-PF linkage**. We will **start recruiting participating companies and members** by publishing the website and information provision.

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(2) Overview of Public Relations Activities in FY2023

- As a measure to promote recognition and understanding of the Japan Mobility Data Space, we considered creating an information dissemination website related to the construction of the Japan Mobility Data Space and the Smart Mobility Platform, and collaborating with external media.
- The website for the Japan Mobility Data Space is scheduled to be published next fiscal year together with the prototype release.

Formulation of Public Relations Strategy

Examining Public Relations Strategies to Reach and Promote Understanding Among a Wide Audience

Planning of Public Relations Measures

Creating the Official Japan Mobility Data Space Website for the May 2024 Release

■ Design Image of the Website

Key Visual

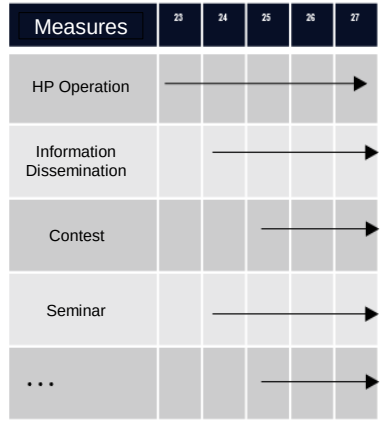
JMDS Concept

■ Structure

Page Structure	Content
Top	Notice
	About us
	About SIP
	Greetings
	Contact Us
Concept Page	JMDS Concept
	What is Smart Mobility?
	What is a Data Space?
	What is JMDS?
	Service Image to Realize JMDS

Formulation of Public Relations Plan

Based on the strategies and measures, a public relations plan was formulated (see next page).



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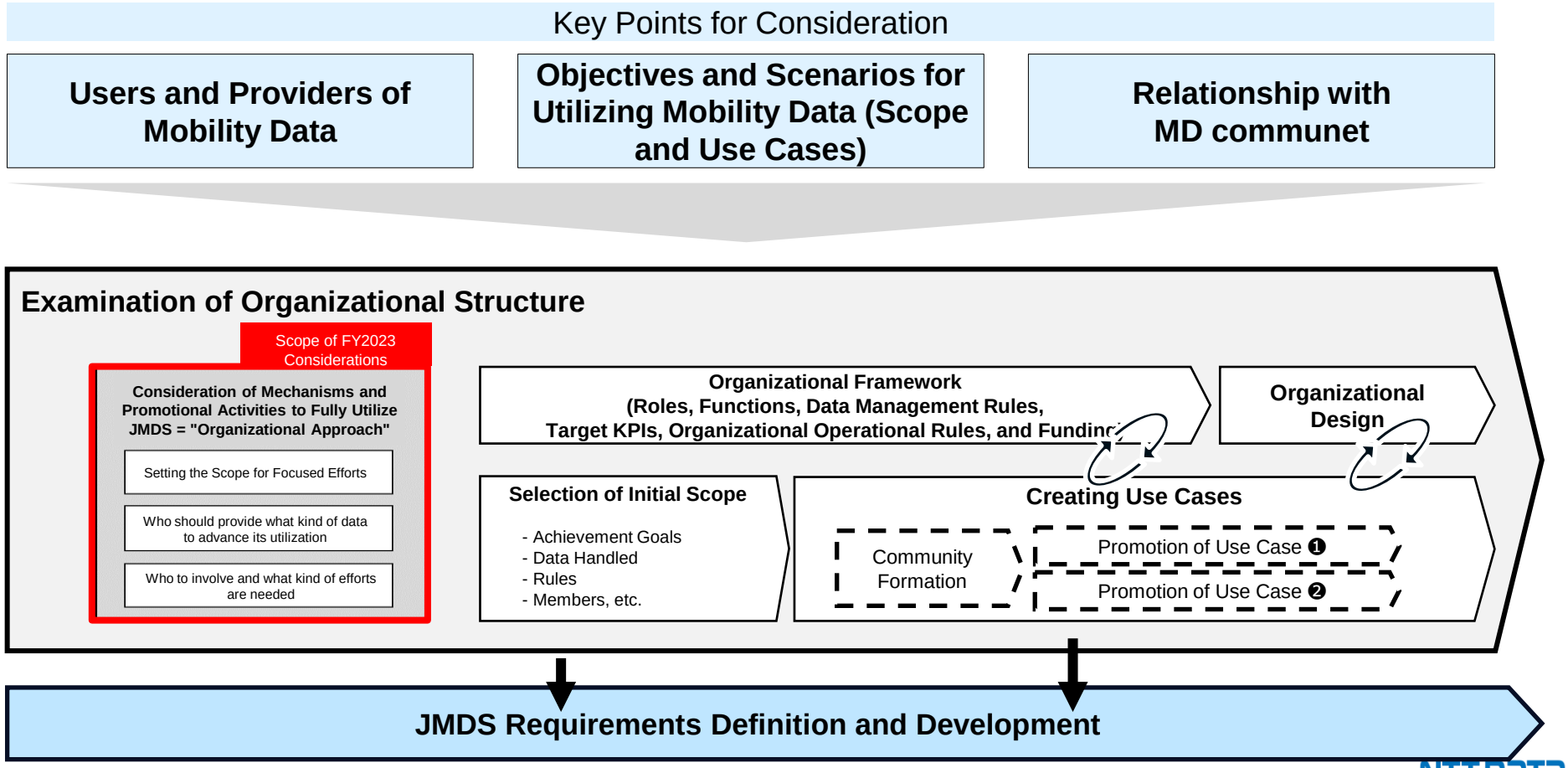
(3) Examination of the Consortium's Approach to Promoting the Utilization of JMDS

- To expand the number of JMDS users, we considered the establishment of a consortium composed of related companies and experts.
- In examining the consortium's approach, we envisioned the scope of JMDS and the use cases for mobility data, and specified the targets (users and providers of mobility data) as participants in the consortium.
- Additionally, we considered the role of the consortium’s management body, taking into account the relationship with MD communet® and other factors.



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(4) Challenges for the implementation/Actions for the next fiscal year

■ Our challenges and actions for the next fiscal year are as described below:

	Challenges for realization	Future response activities
Awareness/Spread	Increase in awareness of JMDS	Aim to first increase awareness and form a community by disseminating information through the JMDS website and external media and hosting events, focusing on industry stakeholders.
	Involvement of businesses to expand the comprehensive data catalog	Expand the catalog data, mainly with existing MD communet members, and aim to expand data by involving businesses, including SIP stakeholders.
Modality of the consortium	Examination of the optimal service provision form for users	Examine a form to provide services attractive to users, easy to use, and user-oriented, and strategically study what kinds of companies and organizations to involve.
	Establishment of an organization to realize data association	Create an organization for promotion, exploring collaboration with other industry groups, existing PFs, and organizations.

Actions for the next fiscal year

- ✓ **Host information dissemination/events to increase awareness of JMDS**
  - Increase awareness among mobility industry stakeholders by disseminating information through the JMDS website, external media, and events
- ✓ **Make fellow members to plan the consortium's organization/form a community**
  - Study a service delivery form from users' perspective
  - Identify players who should be involved from the planning of the entire promotion organization and reach out to them

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2.2 Theme ⑩
Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility

2.2.1 Construction of a digital sandbox

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(1) Summary

Aim of the project	■ Construct a platform (digital sandbox) designed to allow effectively use of evidence, simulations, and use cases and improve business efficiency in order to improve the certainty of the introduction of mobility services, etc.
Goal in FY2023	■ Study requirements for designing and prototyping digital sandbox services.
Implementation items/Examination process	■ **Digital sandbox concept (hypothesis) design** • Specialized knowledge, technology, and data needed to make agreements among stakeholders and run simulations required to make the agreements, causing high hurdles to be placed to implement it. • Planning of a platform on which anyone can easily run simulations according to a purpose in collaboration with businesses that have skill and content for simulations and businesses that have data necessary for execution. ■ **Needs hearing to people concerned** • Hearing with people concerned to confirm the process in needs and mobility introduction, based on the hypothesis mentioned above. • ① Needs confirmed for efficiently collecting and organizing evidence and other relevant matters required for agreement and decision-making. • Understanding of a fact that simulation know-how had not been established in the new mobility introduction process and existing mobility change process. ■ **Review of the concept and concretization of the use/application image** • Redesign of the concept based on the above hearings. Planning of a service that helps users to launch new services by accumulating case studies and know-how and expanding usable simulations. • Examination of users and expected needs of utilization with assumed specific usage scenarios (public transportation planning, PDCA, etc.). • Implementation of adjustment of functions and architecture for system implementation based on the concept.
Plans/Outlooks	■ We will continue to give relevant parties hearings to make the concept of the digital sandbox clearly established. We will proceed with the construction of the prototype. ■ We are planning specific measures for collaboration with collaborative parties and collaboration with respect to other themes and teams.

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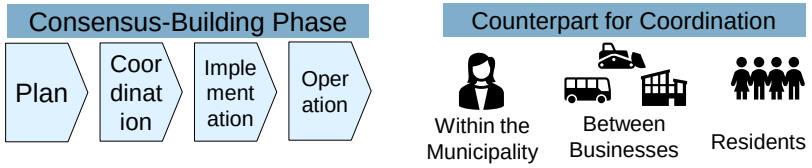
(2) Reevaluation of the Overall Service Concept

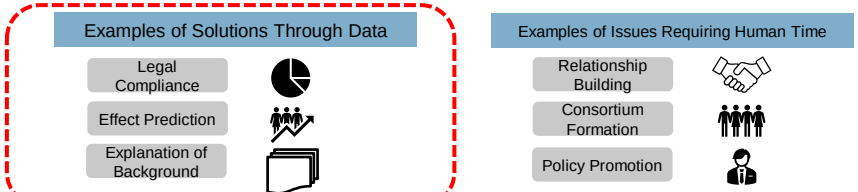
- Based on the needs obtained from the hearings, we reevaluated the necessary functions of the digital sandbox and reorganized the overall service concept.
- The digital sandbox will provide an environment where users can register and utilize their project examples and simulations conducted by others. By accumulating project examples and expanding simulations that can be used along with knowledge from past cases, we aim to develop a support tool that helps users increase the feasibility of their MaaS (Mobility as a Service) businesses.

Decision-Making Needs Based on Hearing Results

■ There are various targets and phases to be adjusted, and the necessary information varies each time.

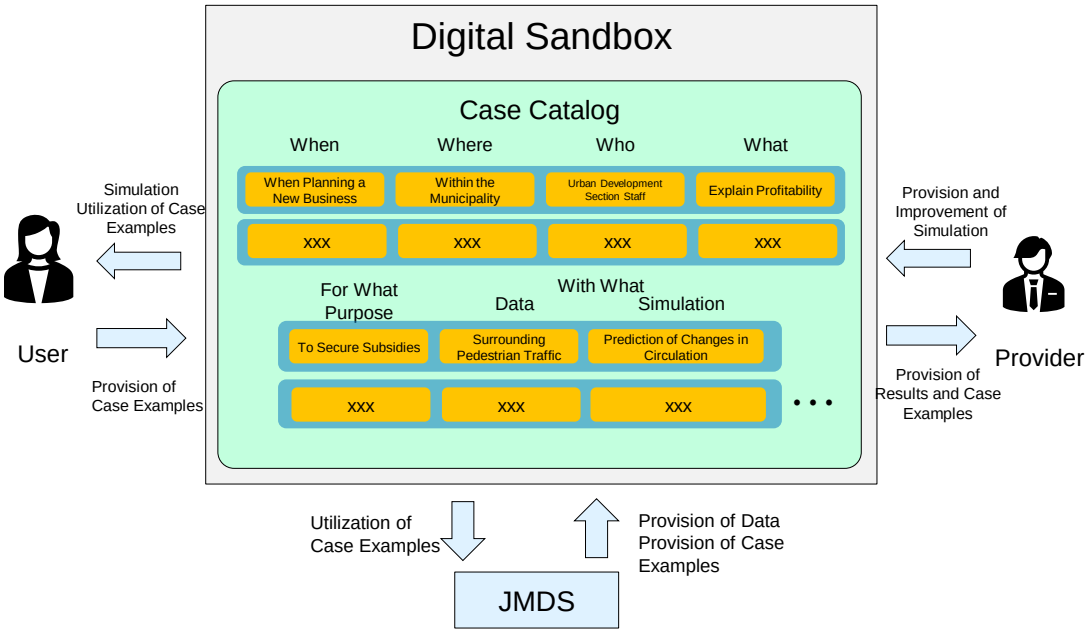


■ Some issues can be solved with data, while others require time and human effort to resolve.



Areas That Can Be Supported by the Digital Sandbox

The Desired Direction for the Digital Sandbox



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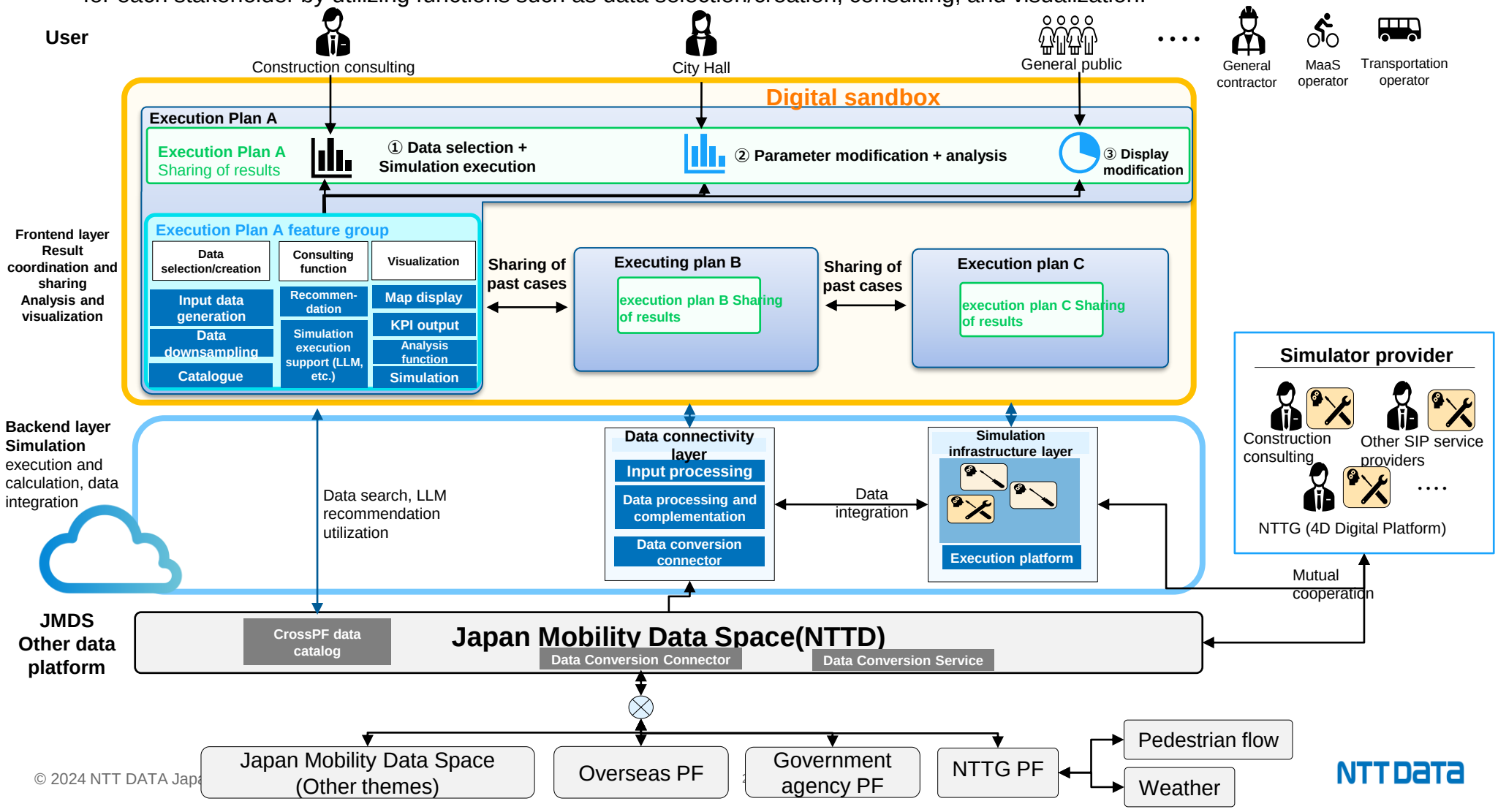
(3) Functional requirements and system configuration of the digital sandbox

- Based on the concept and needs survey, we are implementing the translation into the system configuration image and function organization.
- By connecting with JMDS and efficiently utilizing the necessary data, we aim to realize a service that enables business efficiency for each stakeholder by utilizing functions such as data selection/creation, consulting, and visualization.



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(4) Challenges for the implementation/Actions for the next fiscal year

- Continue to give hearings to determine use cases.
- Clearly define the concept of the digital sandbox, study methods for linking data and simulators, and proceed with design and prototype production.

	Challenges for realization	Future response activities
Use cases/Commercialization	Shaping of hearing results into use cases	Give additional hearings to make use cases established
	Shaping of needs of simulation providers	Survey needs of companies that provide simulators, such as construction consultants, and examine schemes that are easy for existing companies to provide
	Coordination of collaboration with other themes/Study of methods	Conduct contact and coordination with collaborators
Technical aspect	It is necessary to study how to hold a simulator because simulators need a specific run-time environment.	Investigate simulator run-time environments and study whether to run it on a digital sandbox or put API linkage
	Regarding data linkage techniques. It is necessary to separate from JMDS	Examine with JMDS team how to link with JMDS
	Examination of how to implement functions using LLM	Clearly determine functions to be implemented through additional hearings and shape them into detailed design

Actions for the next fiscal year

✓ **Examination of use cases**
- Additional research: Research into processes in transportation plans and regional issues and urban plans by using mobility
- Research into necessary data and simulators

✓ **Coordination of collaboration**
- Coordination of collaborators with other themes
- Coordination and accumulation of cases of collaboration
- Coordination with data and simulator collaborators, and examination of collaboration methods

✓ **Requirements definition/Prototype production**
- Function organization and requirements definition
- Detailed design

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2.2 Theme ⑩
Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility

2.2.2 Linkage between urban data and mobility data

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(1) Summary

Aim of the project	■ Promote support for people with mobility difficulties such as autonomous robots and electric wheelchairs and **new mobility service implementation** through linkage with JMDS.
Goal in FY2023	■ Clearly define the role JMDS should fill of in implementing new mobility services such as autonomous robots.
Implementation items/Examination process	■ **Survey on trends of policies and service providers** • Survey on trends of policies, R&D projects, and service providers related to new mobility operation, etc. • Establishment of a future vision of new mobility services on the assumption of commercial and office areas in urban areas, based on that mentioned above. ■ **Determination of challenges for realizing new mobility services** • Visualization of tasks and flows required to realize the future vision and examination of barriers and issues for the realization. • Major problems supposed: ① Data and resources necessary for services are not shared, ② Large burden is put on people concerned for agreement and arrangement, and ③ It is difficult to predict needs and profitability, etc. ■ **Examination of the role JMDS should fill of** • Examination of the role JMDS should fill of to realize new mobility services in light of the problems above mentioned. • Assumption that we will be encouraging inter-operator data and resource sharing and utilization in the short term, and we will be planning to promote implementation of services through agreement using simulations, etc. in the medium to long term.
Plans/Outlooks	■ We are planning to exchange opinions with other themes to conduct SIP Disaster Prevention and new mobility initiatives and study specific use cases and data integration techniques.

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(2) Overview of the Discussion

■ In order to clarify the roles that should be fulfilled as a mobility data space for the realization of services such as autonomous robots, we will examine various policy trend surveys, identify challenges for realizing the service, and consider the roles that JMDS should play.

Purpose

- In the examination of the mobility data space, there is an expectation for collaboration with new mobility options that can be used for supporting individuals with mobility difficulties and various services, such as autonomous robots and electric wheelchairs.
- On the other hand, it is difficult to say that the roles that SIP should play have been clearly defined, given that the current state of policy trends related to the data and functions necessary for the realization of services using new mobility, as well as the trends of service providers offering these, are not well understood.
- Based on this current situation, various policy trend surveys and stakeholder status investigations will be conducted with the purpose of clarifying the roles that should be fulfilled as a mobility data space for the realization of services such as autonomous robots.

Process of Discussion

FY2023

From January	From February	From March
Survey on Trends of Policies and Service Providers	**Identification of Challenges for Realizing Services Using New Mobility**	**Examination of the Roles and Future Vision of the Mobility Data Space**
[Content] **-Survey on trends of related policies, research and development projects, and service providers related to the operation of new mobility.** **[Survey Targets (Examples)]** **-Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Barrier-Free Navigation Project** **-Ministry of Land, Infrastructure, Transport and Tourism (MLIT) PLATEAU** **-Ministry of Economy, Trade and Industry (METI) Demonstration project for realizing deliveries using autonomous robots** **-DADC Autonomous Mobile Robot Architecture, etc.**	**[Content]** **Based on the aforementioned surveys, we will identify concrete use cases and ideal scenarios, organizing the necessary functions and data required for the operation and service provision of new mobility, as well as the challenges that serve as barriers to realization.**	**[Content]** **Based on the challenges mentioned above, we will examine the future vision of new mobility operations, the challenges in realizing future mobility services, and the roles and functions that the mobility data space can undertake to address these challenges, as well as the value it can provide as a service.**

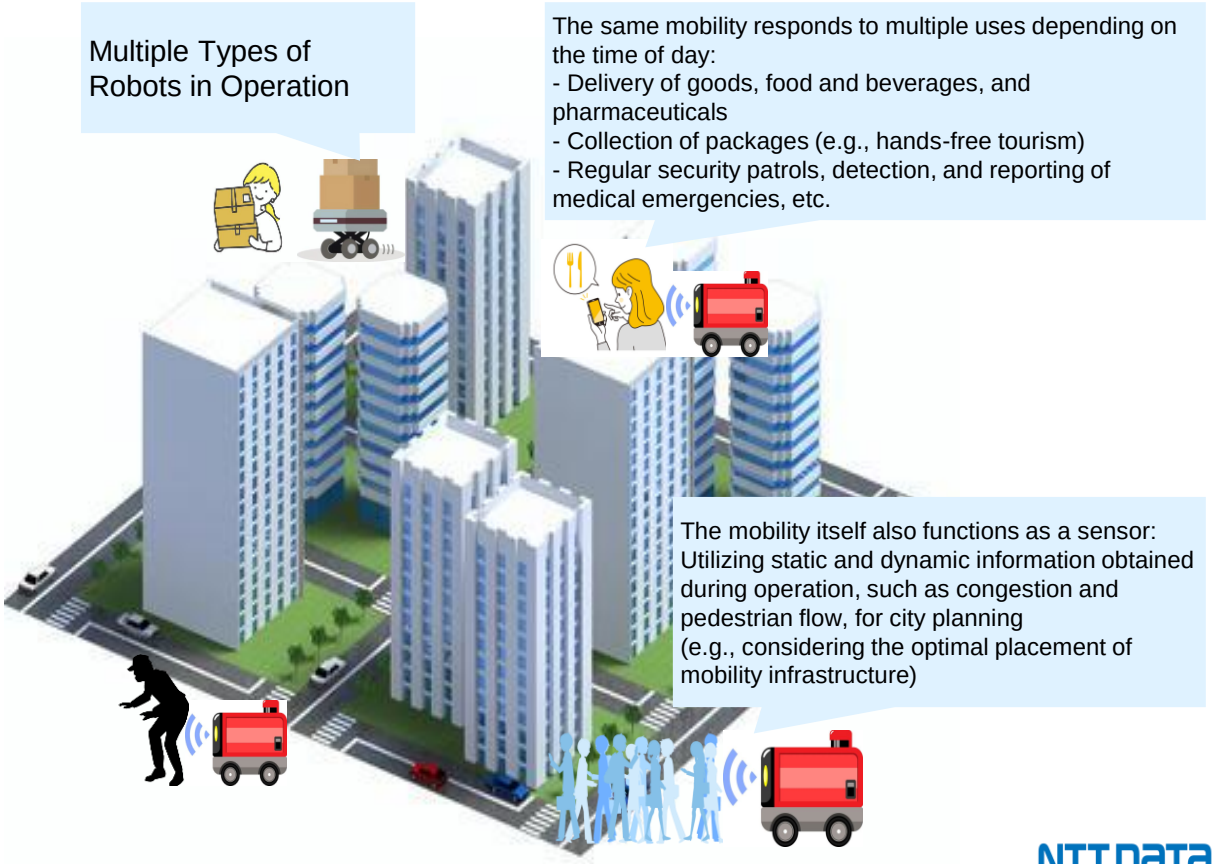
(3) Organization of Necessary Items for the Operation of New Mobility

1. Future Vision (Assumptions)

- In identifying the challenges, we will set a future vision for new mobility services based on use cases anticipated in urban areas where business demand is relatively high.
- In commercial and office areas, it is assumed that various services provided by mobility will flexibly handle tasks such as the delivery of food and beverages to office workers and visitors, collection of packages from offices, and security and regular patrol duties.
- Information obtained from mobility, such as pedestrian flow, will be utilized for city planning.

■ Future Vision of Mobility in Urban Areas

Area	Commercial facilities and office areas in urban districts with multiple buildings (1 to 2 square kilometers)
User	Businesspersons working in office buildings Visitors to commercial facilities (+ Developers, tenants, etc.)
Operational Environment for Mobility	• Multiple types of robots operate simultaneously. • The robots are managed and monitored by a service provider responsible for robot operation management. • Depending on supply and demand, a single robot can be used for different purposes at different times of the day (e.g., delivery of food and beverages during the day, security at night). • Infrastructure such as charging, communication, and smart buildings is shared.



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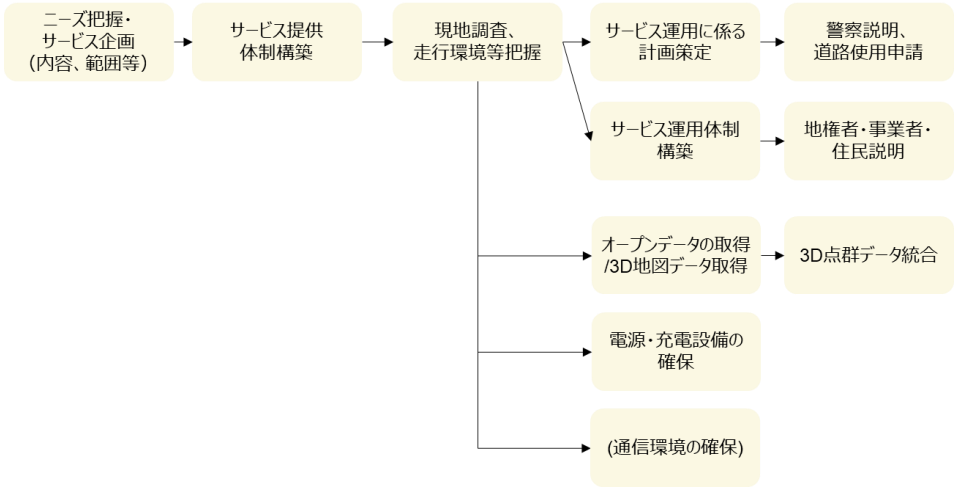
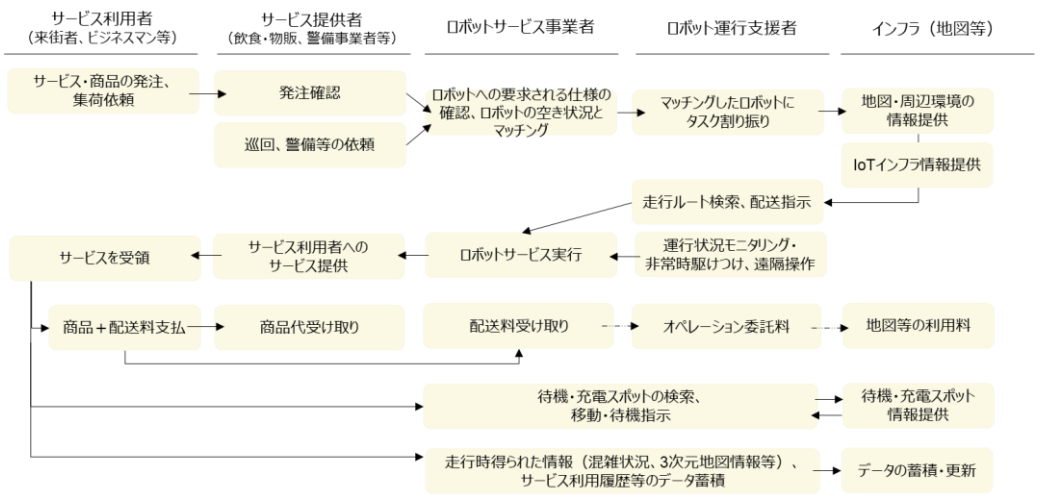
(3) Organization of Necessary Items for the Operation of New Mobility
2. Organization of Challenges in the Operation of Mobility

- Referring to demonstration projects, visualize the tasks and workflows necessary for providing new mobility services, and examine the barriers and challenges to realizing these services.
- The main challenges include:
  1. The necessary data and resources for the service are not shared, preventing a reduction in service costs.
  2. The effort involved in consensus-building and obtaining approvals from stakeholders is significant.
  3. It is uncertain to what extent and at what timing demand will occur.

Service Design Phase



Service Delivery Phase



Necessary data and resources for mobility operation must be procured individually → High costs

The effort required for discussions and consensus-building with stakeholders is significant
(e.g., landowners, residents, police, etc.)

It is necessary to consider **the placement of mobility in accordance with the timing of demand occurrence.**

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(4) Role of JMDS

- Based on the flow and challenges mentioned on the previous page, consider the roles of JMDS.
- In the short term, given the high costs associated with new mobility operations and the difficulty in implementing services, JMDS is expected to facilitate the realization of low-cost services by intermediating and enabling the use of data and resources from existing operators.
- In the medium to long term, JMDS may also contribute to the formation of consensus and the realization of efficient services through the use of simulations.

■ Potential Roles of JMDS

[Short Term]

Intermediation of Data Required for New Mobility

- Match companies that possess data necessary for mobility, such as 3D urban model data and congestion information, and realize data collaboration through JMDS.

[Medium Term]

Evaluation of Business Feasibility through Simulation, Consensus Building with Stakeholders

- Simulate the feasibility of services utilizing new mobility based on urban environment and service usage history data related to city planning.
- Promote consensus building among stakeholders for project implementation based on the above results.

[Long Term]

Demand Forecasting and Optimal Placement of Mobility for Services Utilizing New Mobility

- Provide demand forecasting simulations for services utilizing new mobility in situations where the services are widely adopted and actively used.
- Maximize service utility and profit through the optimal placement of robots based on data.

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(5) Challenges for the implementation/Actions for the next fiscal year

- We are planning to shape up concrete use cases and linkage plans, exchanging opinions on other themes related to SIP Disaster Prevention and new mobility, to refine on future plans and mutual roles, with an eye toward the next fiscal year.

	Challenges for realization	Future response activities
Use cases	Confirmation of the role JDMS must fill of, feeling those concerned have for the implementation items, and needs	Give those concerned hearings and brush up as necessary
Use cases	Construction of hypotheses for specific use cases concerning linkage with SIP Disaster Prevention	Have discussions with SIP Disaster Prevention. Materialization of use cases for linkage
Use cases	Association with new mobility manufacturers, businesses, etc. that can provide data necessary for driving	Clearly determine functions and scopes of responsibilities through exchange of opinions, aiming at linkage with other SIP themes
Technical aspect	No references that are commonly agreed upon in the industry regarding data and physical environments necessary for driving	Exchange of opinions and collaboration with other businesses Stimulate discussions within the industry, based on knowledge gained from demonstrations, etc.
Technical aspect	Very few examples of service implementation, causing no track records, methods, or know-how for simulations to be unestablished	Establish know-how, collaborating with other leading businesses and other SIP themes, etc., and making use of achievements

Actions for the next fiscal year

✓ **Have discussions on linkage with other SIP themes**
- Clearly determine issues and scopes of responsibilities through hearings from stakeholders
- Make use cases and demonstrations concrete

✓ **Linkage with SIP Disaster Prevention**
- Make use cases concrete, based on the development scope, capabilities, and issues during disasters with respect to SIP Disaster Prevention
- Clearly determine linkage content and mutual roles, and shape them into demonstrations and other verifications

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2.3 Theme ⑪

Development of mobility-enabled services on urban OS

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(1) Summary

Aim of the project

- Implement a variety of mobility services through **linkage between JMDS and City OS**.

Goal in FY2023

- Make **new mobility services (proposals) of a type designed to solve regional issues/social issues** and linked with City OS concrete.

Implementation items/Examination process

2.3.1 Chichibu City, Saitama Prefecture

- **Examination of use case hypothesis**
  - Examination of a use case hypothesis for Renewable energy utilization x Mobility business services, taking into account issues Chichibu City is facing and other matters.
- **Hearings from those concerned**
  - Confirmation of needs for tourists on holidays based on hearings from those concerned, residence population analysis, etc. Materialization of use cases for tour promotion by making use of EVs.
  - More hearings because weekday needs have not been fully identified.
- **Examination of general pictures/functions of the system**
  - Hearings from leading municipalities, etc., to plan a system on which tourism analysis in which JMDS, City OS, etc. are linked and degrees of contribution to the environment are visualized.
  - Arrangement of overall system configurations needed for the implementation and elements required for dashboard.

2.3.2 Sakai City, Osaka Prefecture

- **Categorized installation standards arrangement for mobility hubs**
  - Organization of indicators to be referenced in order to study types and locations of mobility hubs with reference to initiatives in foreign countries.
- **Selection of locations at which mobility hubs are placed based on data**
  - Three locations selected for the locations at which a mobility hub is placed, such as areas with high population density, large commercial facility, etc., through effective use of information of locations, SNSs, open data, etc.
- **Examination of mobility hub services**
  - Specification of user images (personae) of the mobility hubs, based on location information analysis and hearings from the local residents.
  - Study of content to be placed in the mobility hubs, based on customer journeys of assumed users, or ① active senior couple households, ② households with junior high and high school children, and ③ young couple households.

Plans/Outlooks

- We will make weekday use cases concrete through hearings from related parties.
- We will examine measures, PR methods, etc. to encourage tourists to have behavioral change.
- Make coordination and consensus between related parties in preparation for the start of operation.
- We will conduct user behavior change measure studies and service development.

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2.3 Theme ⑪
Development of mobility-enabled services on urban OS

2.3.1 Collaboration with Chichibu City, Saitama Prefecture

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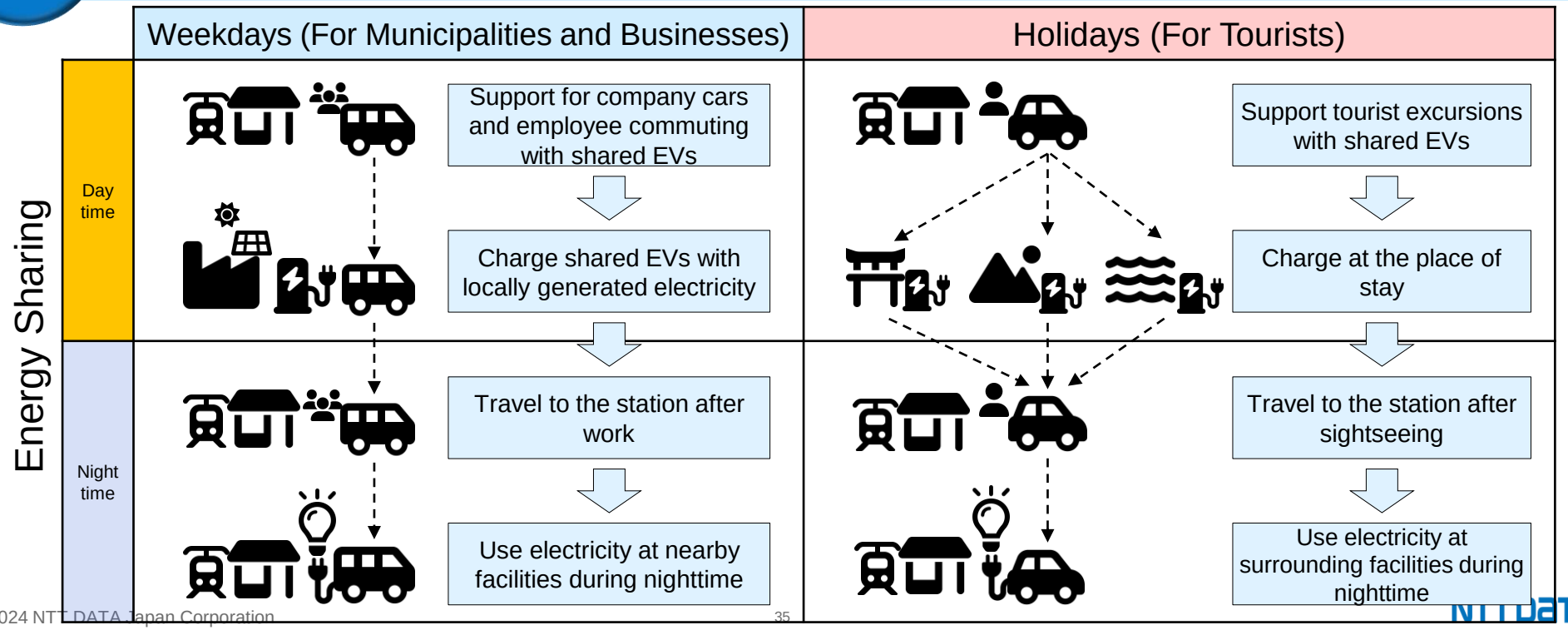
(1) Concept of Implemented Services

- To address the issue of insufficient secondary transportation in Chichibu City, we are considering the introduction of optimal mobility sharing to secure transportation means for tourists and enhance the city's attractiveness through its regular use. The goal is to ensure a stable utilization rate of mobility and establish a viable mobility sharing business in regional cities.
- Additionally, to contribute to the mobility business and solve environmental issues, we are considering adding value to mobility, such as by promoting local production and consumption of energy.

Concept

Sharing of Mobility (Transport) and Energy (Electricity)

A win-win business model that uses IT to achieve optimal sharing (overall optimization) centered on electric vehicles (EVs), making each stakeholder comfortable (value provision) and solving environmental and regional challenges.



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(2) Materialization of Use Cases Based on Hearings and Other Inputs

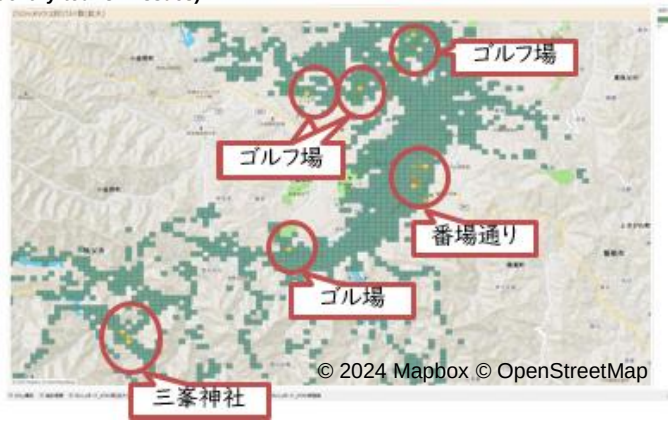
- Based on hearings from stakeholders such as municipalities and industrial parks, and an analysis of the resident population, we considered use cases for mobility services utilizing locally produced renewable energy.
- While we were able to clarify collaboration plans to address the issues and needs of tourists using the services on holidays, we have not yet fully captured the needs for weekday use. We will continue to conduct hearings and refine the use cases and collaboration plans for weekdays.
- In coordination with Chichibu City, we decided on the vehicle selection and parking locations that are appropriate for the contents of the considered use cases.

Analysis of Resident Population, Hearings from Industrial Park Demonstrations, and Analysis of Use Cases (Hypotheses) for Companies and Municipalities

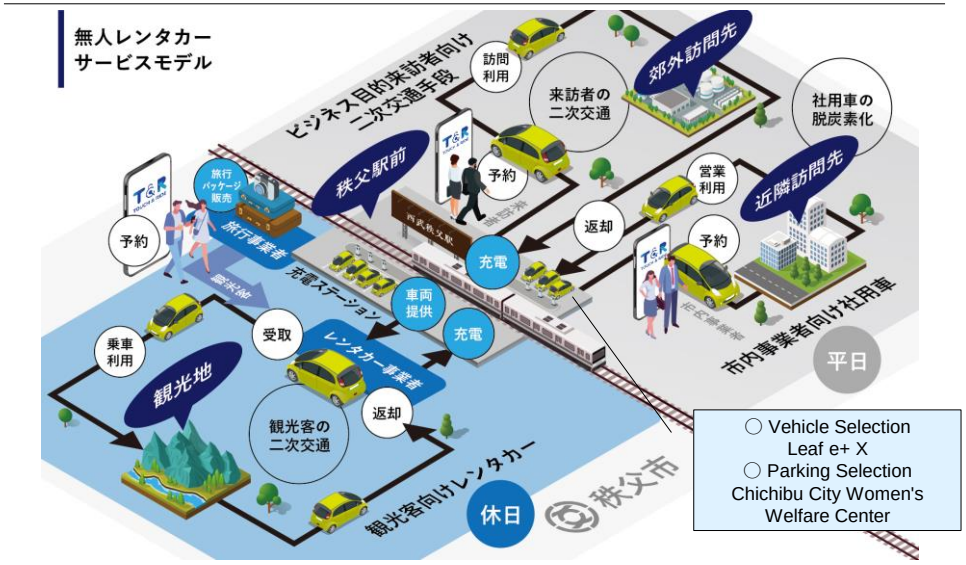
- Conducting surveys and interviews with stakeholders regarding the use case proposals (Weekdays: 9 companies surveyed, 2 companies interviewed / Holidays: 3 organizations interviewed)

区分	調査対象	調査内容	結果
平日ユースケース	みどりが丘工業団地の企業	・工業団地の全企業を対象に、通勤手段に関するアンケート調査 【仮説】 通勤に自家用車が必須であることが、雇用拡大の阻害要因となる	• 公共交通機関での通勤が難しく、8割以上が自家用車で通勤。 • **自家用車での通勤が雇用の前提条件になっていることに課題感は感じていない。** ➢ ほぼ従業員は、秩父内で雇用しており、自家用車を持っていることが当たり前になっている
休日ユースケース	・秩父市観光課 ・おもてなし観光公社	・秩父での観光課題のヒアリング	• 特定の観光地への集中、日帰り観光客が多いことによる消費金額の少なさが課題。 • **レンタルEVを利用し、観光回遊を促す**ことが必要。 • 滞在時間を延ばし、消費額を増加させるため、宿泊施設と連携する施策の検討に意欲あり。
	・鉄道事業者	・交通事業者とのプロモーション連携に関するヒアリング	• **鉄道事業者の既存商品（デジタル乗車券）との連携**により、利便性を高める。 • レンタルEV予約とのシステム連携に係る時間、約款の整合や運用案内の整理に工数が懸案事項

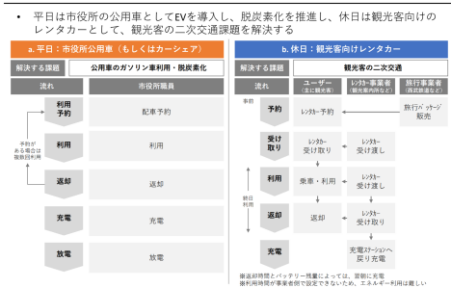
- Analyze congestion statistics to determine the distribution of resident population on holidays (Identify tourism issues)

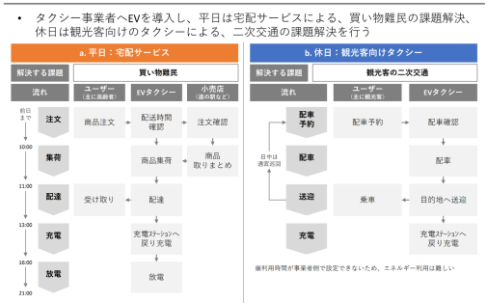


Use Case Proposal



○ Vehicle Selection
Leaf e+ X
○ Parking Selection
Chichibu City Women's Welfare Center





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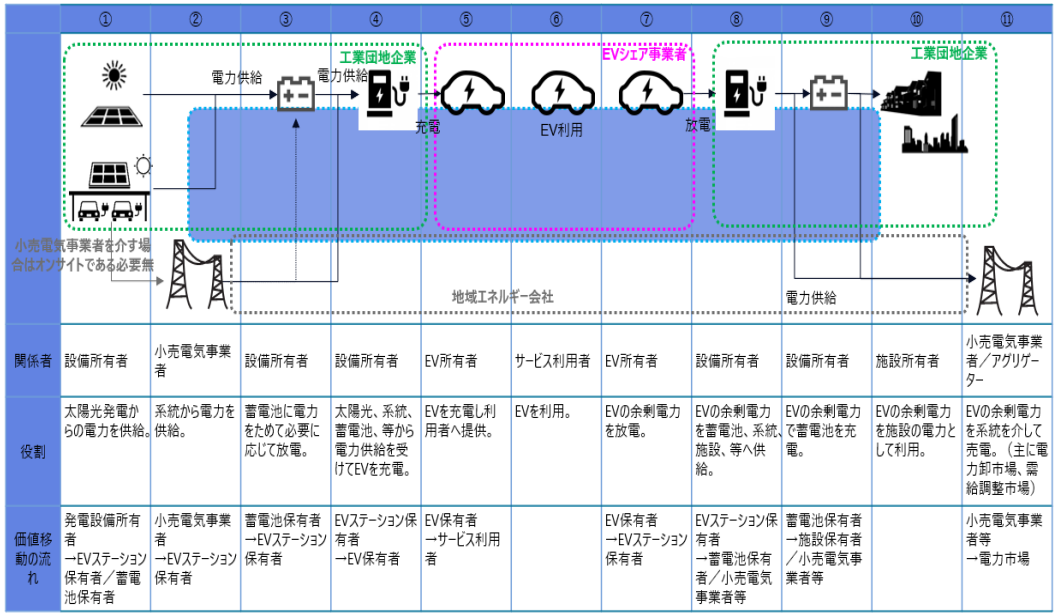
(3) Energy Management System Consideration and Development Results Summary

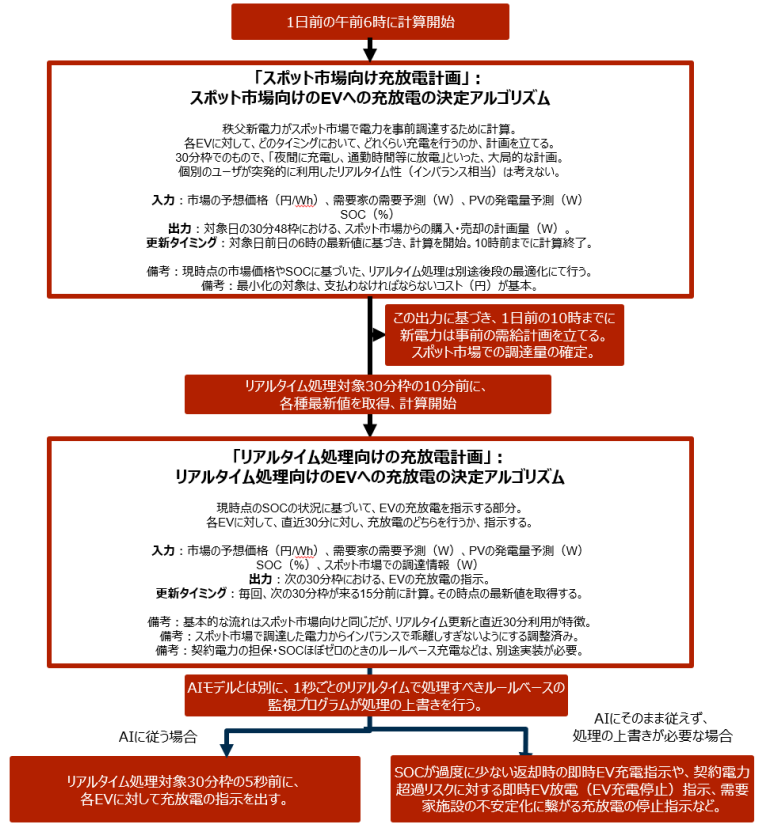
- As the ideal form of energy management using EVs, there are several themes to be examined, including improving the local production and consumption rate of energy, enhancing the economics of charging control, facilitating power exchange without using power distribution networks, and adjusting supply and demand using V2X.
- Based on these themes, we considered use cases and business models that provide energy management solutions aimed at a society where EVs are widely adopted in the future.
- We developed a charging and discharging algorithm utilizing EVs, with a focus on economic rationality, anticipating the generalization of V2H and V2G.

Demonstration Model and Stakeholder Roles



	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
関係者	設備所有者	小売電気事業者	設備所有者	設備所有者	EV所有者	サービス利用者	EV所有者	設備所有者	設備所有者	施設所有者	小売電気事業者／アグリゲーター
役割	太陽光発電からの電力を供給。	系統から電力を供給。	蓄電池に電力をためて必要に応じて放電。	太陽光、系統、蓄電池、等から電力供給を受けてEVを充電。	EVを充電し利用者へ提供。	EVを利用。	EVの余剰電力を放電。	EVの余剰電力を蓄電池、系統、施設、等へ供給。	EVの余剰電力で蓄電池を充電。	EVの余剰電力を施設の電力として利用。	EVの余剰電力を系統を介して売電。（主に電力卸市場、需給調整市場）
価値移動の流れ	発電設備所有者 →EVステーション保有者／蓄電池保有者	小売電気事業者 →EVステーション保有者	蓄電池保有者 →EVステーション保有者	EVステーション保有者 →EV保有者	EV保有者 →サービス利用者		EV保有者 →EVステーション保有者	EVステーション保有者 →蓄電池保有者／小売電気事業者等	蓄電池保有者 →施設保有者／小売電気事業者等		小売電気事業者等 →電力市場

Development of an Algorithm to Meet Power Demand with Renewable Energy and EVs



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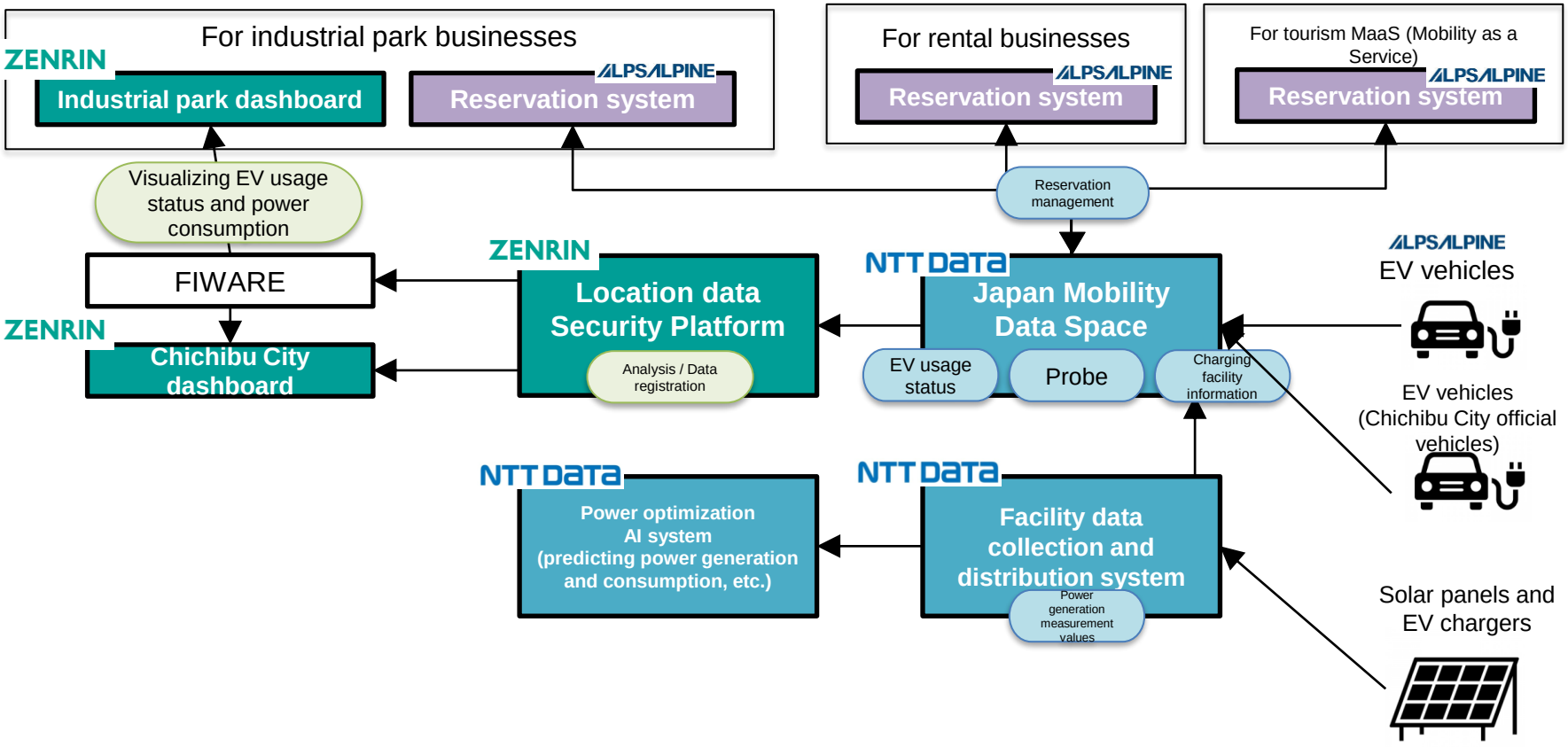
(4) Overview of the system for service realization

- After considering use cases and challenges of leading municipalities, we conducted discussions on the necessary system configuration.
- By collaborating with JMDS and systems provided by various service providers, we aim to visualize tourism analysis and contributions to the environment on the urban OS platform.
- As part of its unique initiatives, Chichibu City plans to electrify some of its official vehicles in the second half of fiscal year 2024, and intends to integrate that information into JMDS. We will also consider services with the expectation of future EV proliferation.



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2.3 Theme ⑪
Development of mobility-enabled services on urban OS

2.3.2 Collaboration with Sakai City, Osaka Prefecture

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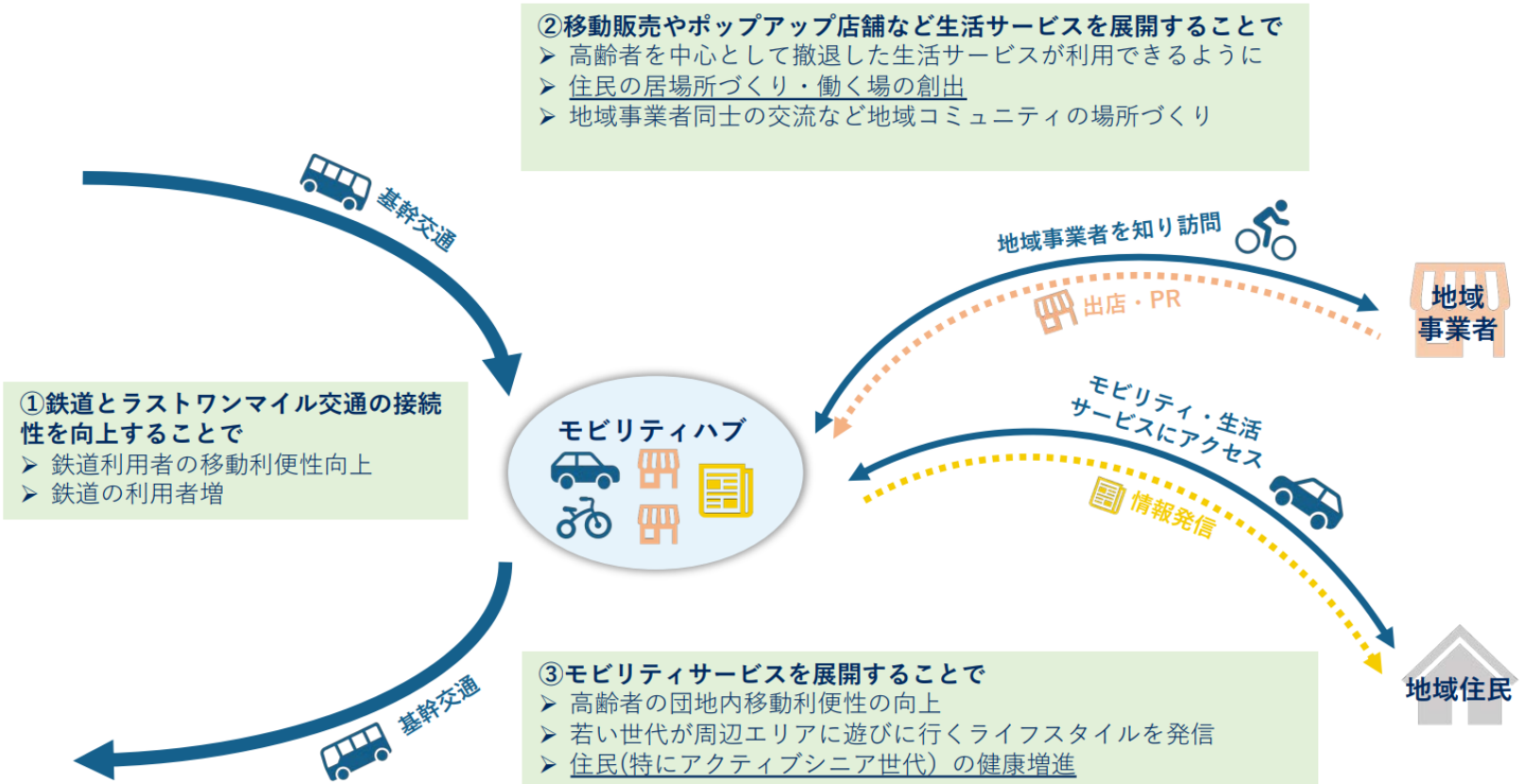
(1) Desired Vision

- We are considering a model of a mobility hub that addresses Sakai City's challenges, such as improving access to senior living services and creating attractive lifestyles for young people.
- We are currently investigating the locations for mobility hubs and the necessary mobility options based on local movement data. Simultaneously, we are organizing the framework necessary to establish these mobility hubs.



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(2) Steps of Consideration

- To consider a mobility hub suitable for the characteristics of the city, we organized the installation criteria, locations, ideal resident profiles, and the content layout.
- Drawing on examples from overseas and other sources, we extracted indicators that could serve as references for the criteria involved in setting up mobility hubs. Based on the analysis of location information, social media, and open data, we examined potential installation sites. In addition to data analysis, we conducted interviews with the intended users to establish personas.
- Through this process, we clarified the mobility challenges of users and considered the content and layout of mobility hubs that could induce changes in their lifestyles.

1. Typology of Mobility Hubs Assumptions for Installation Criteria

Typology

- **Analysis Content**
  Typology of Mobility Hubs
- **Precedent Case Study**
  Reference to Overseas Precedent Cases

Assumptions for Installation Criteria

- **Analysis Content**
  Installation Criteria for Mobility Hubs
- **Precedent Case Study**
  Reference to Overseas Precedent Cases

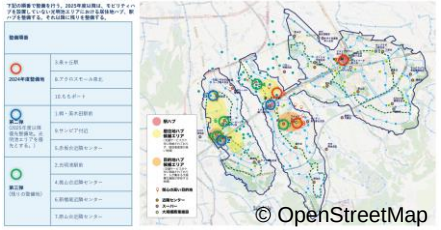
2. Selection of Mobility Hub Locations

Area Selection

- **Analysis Content**
  Areas with High Resident/Destination Population and Areas with Mobility Issues
- **Data Analysis**
  Utilizing J-STAT MAP, Mobile Spatial Statistics, Location Information Open Data, etc.
- **Analysis through Hearings**
  Interviews with Sakai City and Osaka Metropolitan University

Selection of Candidate Sites

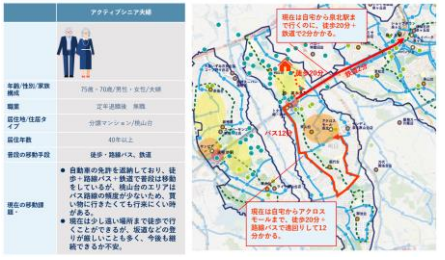
- **Analysis Content**
  Locations with Good Connectivity to Existing Transportation Services and Infrastructure
- **Data Analysis**
  Utilizing Location Information Open Data, etc.



3. Persona Assumptions

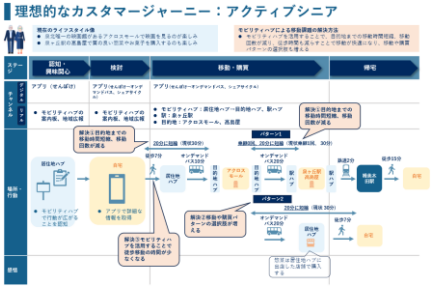
User Analysis

- **Analysis Content**
  Attributes and Lifestyles of Main Residents in the Candidate Areas for Mobility Hubs
- **Data Analysis**
  Utilizing J-STAT MAP and Mobile Spatial Statistics
- **Analysis through Hearings**
  Conducting Interviews with Residents in the Candidate Areas for Mobility Hubs



4. Customer Journey Content Assumptions

Integrating analyses 2 and 3
Conducting a Customer Journey Considering the Content of Mobility Hubs



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(3) Challenges for the implementation/Actions for the next fiscal year

- Proceed to conduct a needs deep-dive and make behavioral change/PR/data linkage measures concrete in order to make use cases that will be fixed while on-site arrangements will be made services actually used in Chichibu City.
- Proceed to make behavioral change/PR/data linkage measures concrete through linkage with the mobility hub construction at a project of the Ministry of Land, Infrastructure, Transport and Tourism in Sakai City.

	Challenges for realization	Future response activities
Chichibu City	Deep dive into a share mobility needs of local companies	Recruit demonstration-cooperative companies and have a brushup while having them actually make use as the installation locations have been determined.
	Behavioral change/PR measures for tourism use	Create packages for tourists and conduct public relations activities in collaboration with hotels, etc. Examine behavioral change measures to encourage tourists to visit tourist spots with fewer tourists.
	Verification to realize energy management to solve regional issues	Verify an increase in the rate of local energy production and consumption, charging control with better economic efficiency, and EVs with off-grid vehicle-to-home capability on the desk/with actual equipment.
Sakai City	Residents' behavioral change measures with mobility hub use	Continue to make behavioral change measures more detailed so that the elderly and younger generations studied in FY2023 go out actively.
	Service implementation of behavioral change measures	Conduct service development, being aware of touch points easy for residents to make use, for the service implementation of the examined measures.
	Mobility hub PR measure	Carry out mobility invitation/PR activities in association with a project for mobility hub construction by the Ministry of Land, Infrastructure, Transport and Tourism.

Actions for the next fiscal year

✓ **Chichibu City**
- Needs hearing of demonstration-cooperative companies
- Demonstration preparation (actual equipment/on-site arrangement)
- Mobility demonstration
- Dashboard development to accelerate policy promotion of local governments
- Service packaging/PR through collaboration with railway companies, hotels, etc.
- Behavioral change measures examination concerning tourists

✓ **Sakai City**
- Examination of Behavioral change measures detailing with utilization of mobility hubs
- Mobility hub PR measures examination
- Service development to promote the use of mobility hubs by residents

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2.4 Theme ⑯
Development of SSM (Shared Service for Mobility) that enables mobility data sharing among startups and other businesses

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(1) Summary

Aim of the project	■ Provide functions necessary for organizations without mobility operation know-how (local governments, tourism, education and welfare organizations, mobility ventures, etc.) to implement services in the form of a low-cost module, aiming to make mobility services more active.
Goal in FY2023	■ Verify hypotheses for issues to be resolved and use cases, and create an SSM requirements definition document and basic design document.
Implementation items/Examination process	■ **Hypothesis formulation for SSM concepts and functions** • Sort-out of tasks required to launch a new mobility service and functions required for SSM. ■ **Hearings from businesses** • Hearings from transportation businesses, product vendors, local governments, etc. to extract issues and needs. • Confirmation that ① agreement between related businesses is a burden in operations and ② there is a need for more efficient collaboration with related businesses. ■ **Materialization of SSM overall picture/functions** • Determination of 3 new functions ① operation adjustment function, ② operation planning function, and ③ external linkage function in planning mode/operation mode, based on the hearings mentioned above interviews and a trend survey of existing services. • Plot in which functions other than the functions ①, ②, and ③ are satisfied through linkage with existing services. • Materialization of business flows, functional requirements, and screen images, and creation of a requirements definition document and system design document for each of the functions ①, ②, and ③. Determination of the order of priority of the development of SSM for the implementation ■ **Study for demonstration** • Start of field studies and sort-out of items to be verified and methods for the verification toward future demonstration experiments.
Plans/Outlooks	■ Construct functions, based on the development priority. Deploy services, making functional improvements in an agile style and making functional additions, based on the demonstrations. Make field adjustments in preparation for demonstration immediately after.

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(2) The Concept of SSM (Concept and Target Customers)

■ By providing SSM primarily to venture companies and small and medium-sized transportation operators, we aim to lower the barriers to launching mobility services and contribute to the revitalization of these services.

■ Challenges of Target Customers

- ✓ Procedures required for operation are cumbersome and difficult to understand
- ✓ There are no systems for managing the vehicles, personnel, and facilities needed for operation, resulting in management being done with Excel or on paper
- ✓ There is insufficient notification and communication of the operation plan (timetable, boarding points, fares)
- ✓ While we want existing transportation users to use the service, there is no integrated guidance available
- ✓ We wish to collect operational data and apply it to future improvements, but sufficient data is not being collected

Developing bespoke systems individually incurs high costs
Reducing costs by relying on manual work significantly lowers the operational level and business viability

SSM Implementation

One-Stop Procedures and Applications Compliant with Traffic Regulations

Providing Reservation and Dispatch Functions

Providing Operational Data Collection Functions

GTFS Creation and Output Functions (Real-time Operational Information Included)

Providing Timetable and Boarding Location Guidance Functions

Standard Equipping of External Collaboration Interfaces

By introducing SSM, systems can be implemented economically,
allowing for cost control while achieving a certain level of operation,
enabling focus on the core business.

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(4) Overall Picture of the Service ① SSM Function Groups

- Based on the results of the hearings and to efficiently achieve business support, we have assumed the utilization of existing products (services, package software) where they exist. We have organized the following as newly developed functions: ① operation coordination functions, ② operation planning functions, and ③ external collaboration functions during planning and operation.

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Legend: SSM New Development Work Categories | Work categories that exist in the market as packages (PKG)

(3) Challenges for the implementation/Actions for the next fiscal year

■ Our challenges and actions for the next fiscal year have been sorted out:

	Challenges for realization	Future response activities
Technical aspect	Problem ①: It is necessary to study how to make linkage for making use of existing products.	Response policy ①: Make arrangement with vendors of existing products and decide on linkage interface such as API linkage implementation.
Use cases/Commercialization	Problem ②: It is necessary to consider examining flows in which how utilization users will actually make use is specified.	Response policy ②: Conduct substantiative experiments, including types of service to be provided to users, to confirm the feasibility.
	Problem ③: Insufficient use of JMDS and digital sandbox.	Response policy ③: Study use cases in which benefits of JMDS and digital sandbox are well used to plan linkage.
	Problem ④: Insufficient work done to spread SSM yet.	Response policy ④: Study promotion methods and plans based on product deployment.

Actions for the next fiscal year (planned)

✓ **Development based on functional linkage**
- Make specifications examination based on linkage with existing products and carry out development work.

✓ **Substantiative experiment**
- Materialize the service form and conduct verification including it.
- Make use-case implementation for functional linkage/business linkage with JMDS and digital sandbox, and conduct substantiative experiment.

✓ **Promotion**
- Examine an overall plan for the promotion, considering tools and persona settings for the promotion.

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03

This year's deliverables

3. This year's deliverables (including those to be internally shared)

■ The following describes the deliverables that have been retained/shared internally, such as achievements of examinations and studies, specifications, etc. in the researches and developments in this year:

R&D themes	List of the deliverables
Theme ⑨ Establishment and demonstration of infrastructures for integrating and sharing various mobility platforms and related data	List of connector comparison survey results
	Results of verification of EDC connector on actual equipment
	List of collaborator PF survey results
	Draft requirements definition
	Testbed outline design
	Catalog data schema definition
Theme ⑩ Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility	Digital sandbox functions definition
	Hearing survey of local governments and businesses regarding MaaS business
	Draft digital sandbox use cases
Theme ⑪ Development of mobility-enabled services on urban OS	Mobility service introduction requirements definition
	EV effective use energy management requirements definition
	Mobility hub introduction requirements definition
Theme ⑯ Development of SSM (Shared Service for Mobility) that enables mobility data sharing among startups and other businesses.	SSM_requirements definition
	SSM system design
	Appendix 1_Survey of cases and problems
	Appendix 2_Hearing survey
	Appendix 3_Survey of existing product services

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