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# Introduction to data spaces

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Information-technology  
Promotion  
Agency, Japan

Digital Infrastructure Center (DISC)  
Digital Engineering Department  
Data Space Group

# About this document

This document is for **beginners** who want **to learn about "Data Spaces"**.

**The Purpose** is to understand,

- What are data spaces
- What is the organizational structure for data spaces promotion
- What use cases are expected in Japan

# Background: global data spaces initiatives

EU, US, and China are increasing their competitiveness and influence by being ambitious over data linkage methods. It is imperative that measures be taken in Japan's domestic industry.

## EU

Data spaces from the **social** economic activity data accumulation

### Data collection

Develop data infrastructure and rules to collect large amounts of data from society.

### Activities

Data collaboration across countries and organizations can now be done securely and quickly, and the use of data by companies will rapidly advance.

**International standardization led by the EU**

gaia-x  
INDUSTRIAL DATA  
SPACE ASSOCIATION



## USA/China

Data spaces from the **personal** economic activity data accumulation

### Data collection

Huge companies alone collect vast amounts of personal data.

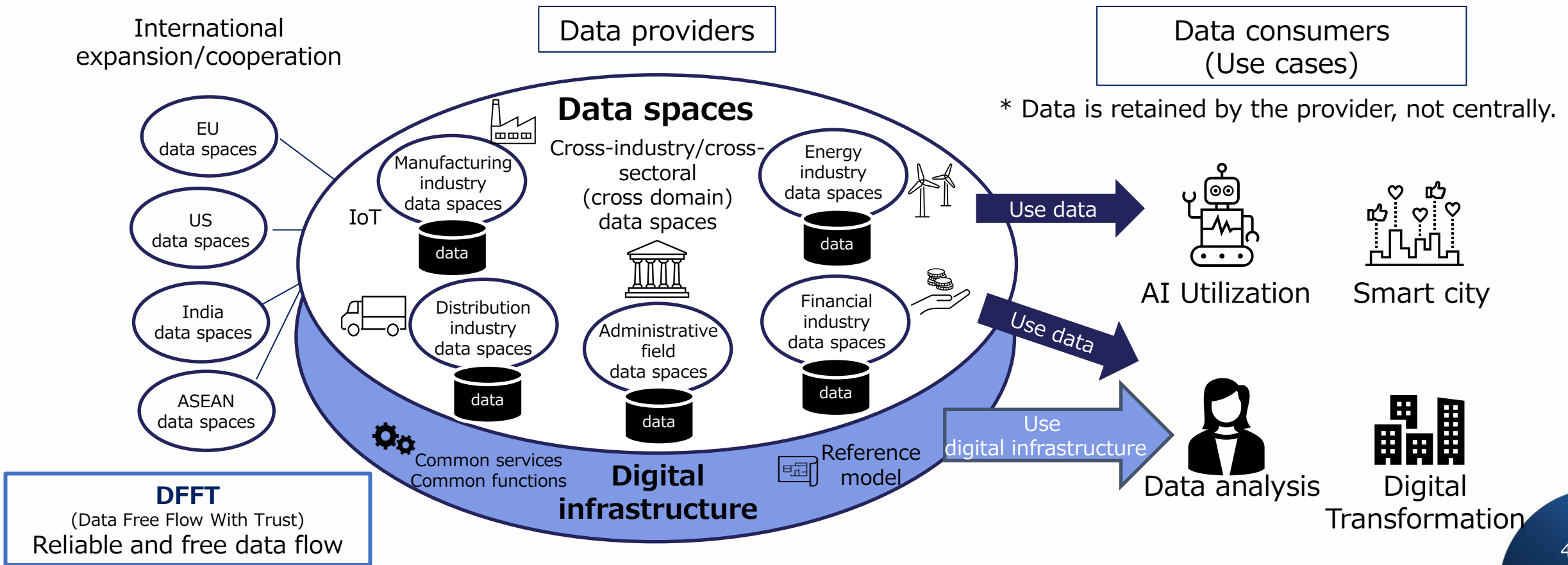
### Activities

Utilize big data collected by platformer to develop services.

**De facto standardization led by stand-alone companies**

# What are data spaces?

- Concept that focuses on indispensable data in the digital society.
- Standardized mechanism that ensures reliability and data sharing among different organizations, countries, and different industries ecosystems.
- Large amount of "diverse" and "reliable" data can be used with security.








# Advantages of data spaces

Widespread use of data spaces will contribute to the realization of "Society 5.0 \*1," which combines economic development through data-driven management and solutions to social issues.

## Business benefits

Realization of **data-driven management**

-  **1. Business speed improvement**  
Anyone can easily and quickly start a new business using data.
-  **2. New business development**  
People with diverse expertise can work together for problems.
-  **3. Better marketing strategy and early detection of problems**  
Advanced data analysis to discover new patterns and trends and provide useful information.
-  **4. Adding value to data owned by the organization**  
Create value from data that has not previously been valued.
-  **5. Improved data security and cyber attack countermeasures**  
Confidentiality (can exchange data with trusted parties).  
Integrity (can prevent data tampering) can be ensured.

## Social benefits

Privacy and a **better life for everyone**

-  **1. Sustainable**  
Enables the realization of a green society.  
Analyze energy consumption data & use energy resources efficiently.
-  **2. Knowledge/ convenient (by digital technology)**  
Optimize transportation systems using traffic data to ease congestion and reduce travel time.  
Provide more accurate weather forecasts by combining existing weather data with IoT data, for example.
-  **3. Safe and secure**  
Forecasting: Predict future events (natural disasters, health crises, etc.) and mitigate risks.  
Disaster prevention: Ensure rapid evacuation guidance.
-  **4. Equality and less disparity**  
Education (research data, education statistics, learning methods, etc.), Business (businesses using data) will have equal opportunities.

\*1 Society 5.0 is a data-driven society promoted by the government of Japan.

# Active and Inevitable aspects of data spaces

Sharing is inevitable and should be actively shared, by the concept of data sovereignty.

## Active perspective

**To enhance competitiveness**, proactively utilize data linkage in business

### New business development

Utilize data from different industries

### Problem solving

Analyze from a new perspective

## Inevitable perspective

**Obligation and necessity**, it is necessary to coordinate with regulations and international rules.

### Regulatory compliance

Necessity to comply with the rules

### Prevention of isolation

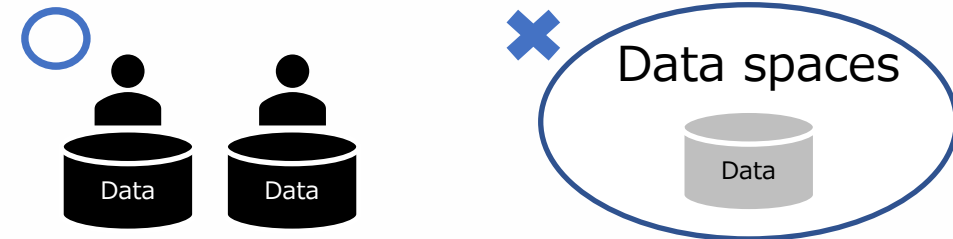
Other than Japan  
Use data space

Example: EU General Data Protection Regulation ( GDPR ) etc.

## Data sovereignty

- "Data sovereignty" is a fundamental concept for **trusting** and sharing data in the data spaces.
- Data providers can decide to whom and for how long data will be provided, etc.

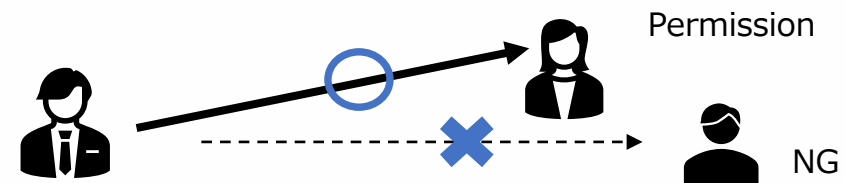
### 1. Rights reserved by data provider



Data is managed by **data owner**

Data is not centrally managed

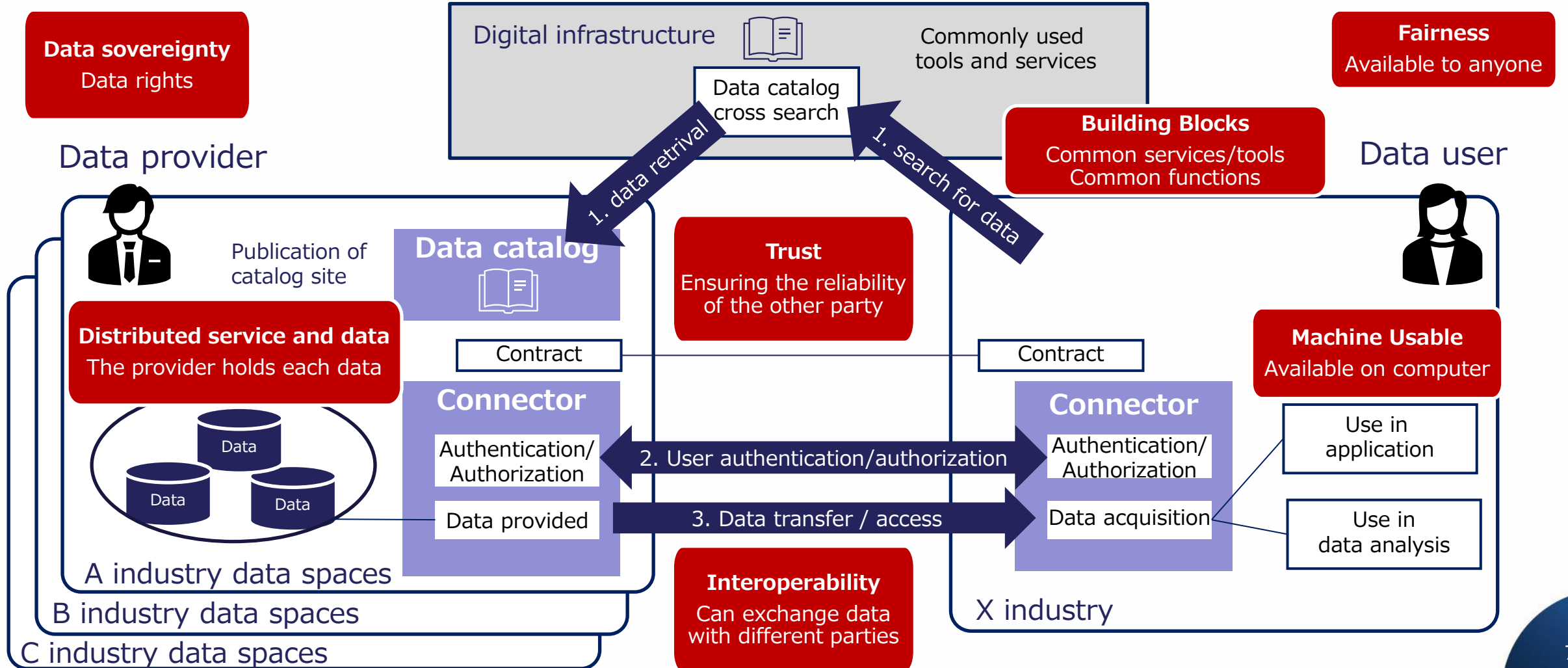
### 2. Limited sharing to specific users





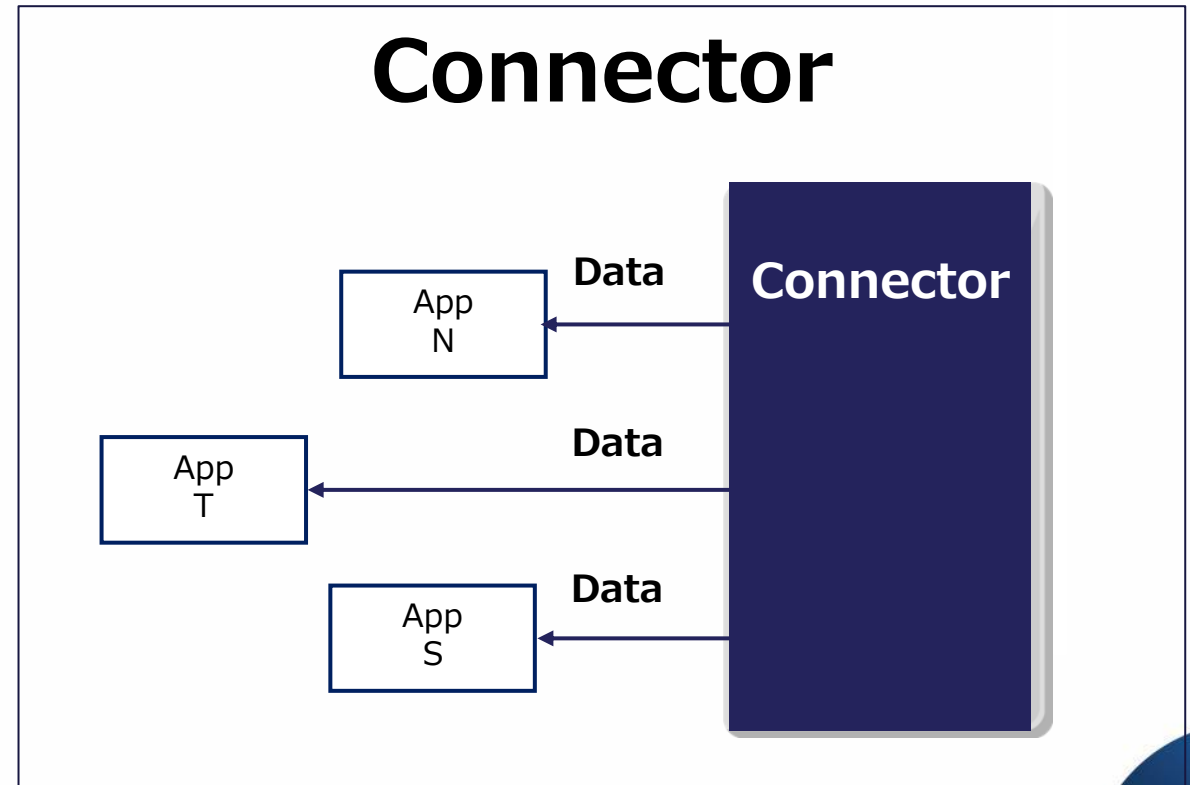
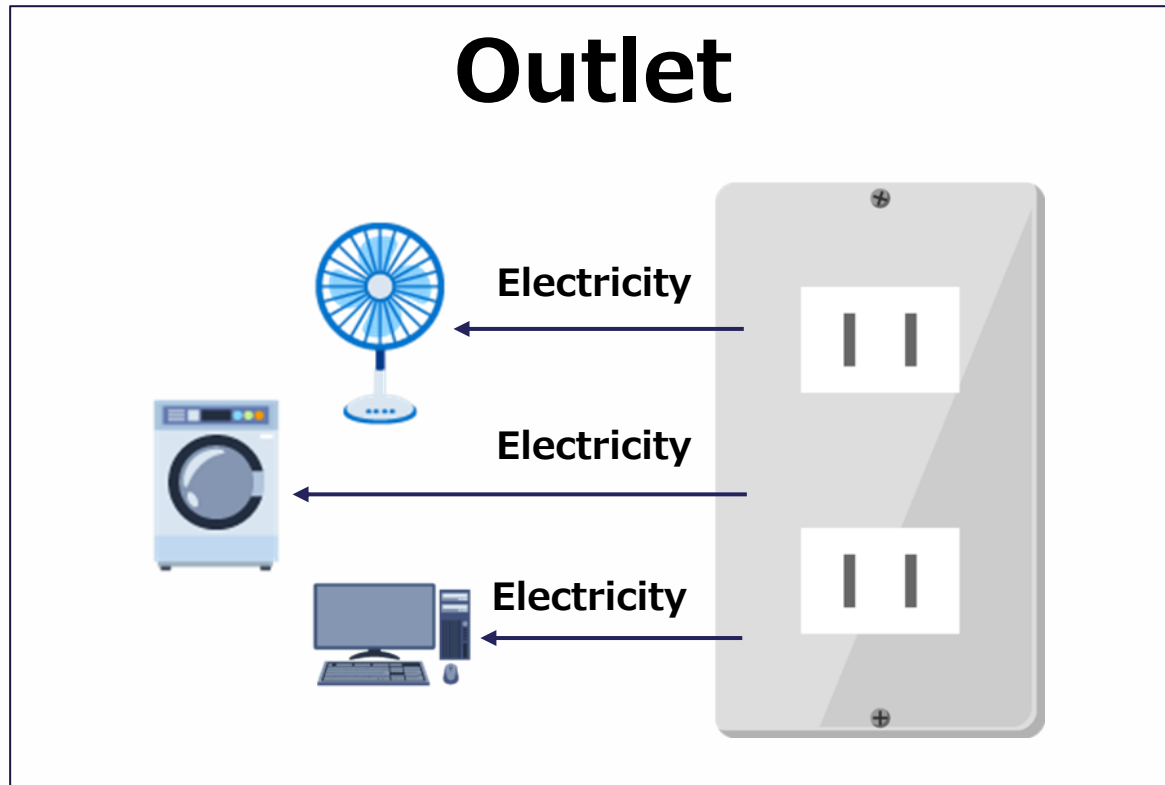
# The image of data space characteristics and data exchange

“Interoperability” and “Data sovereignty” are particularly important characteristics of data spaces.  
 Three main steps for collaboration between data spaces  
 - first, data retrieval, second, authentication/authorization, and third, data transfer/access.



# "Connector" that realizes data exchange

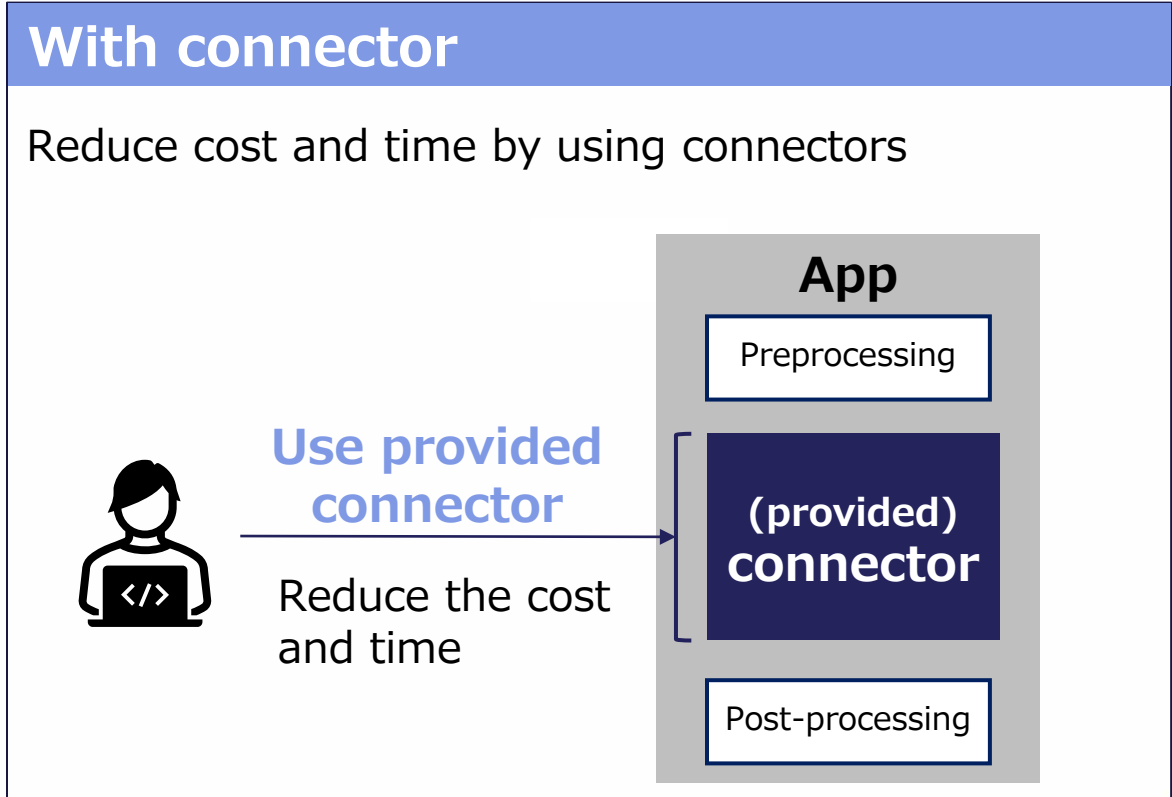
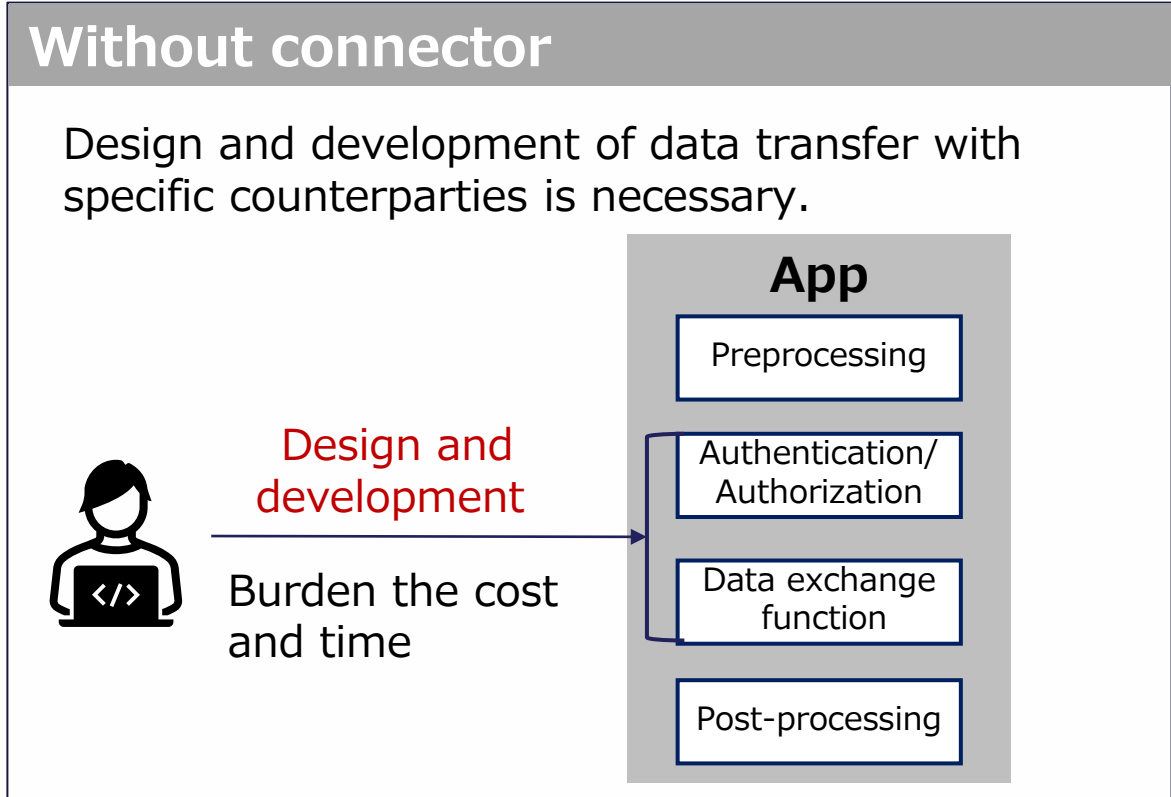
- By using connector, **providers and users can connect each other and exchange the data.**
- Connector is like "Outlet".  
"Appliances" can receive "electricity" by using the common "Outlet".  
"Apps" can access "data" by using a common "Connector".





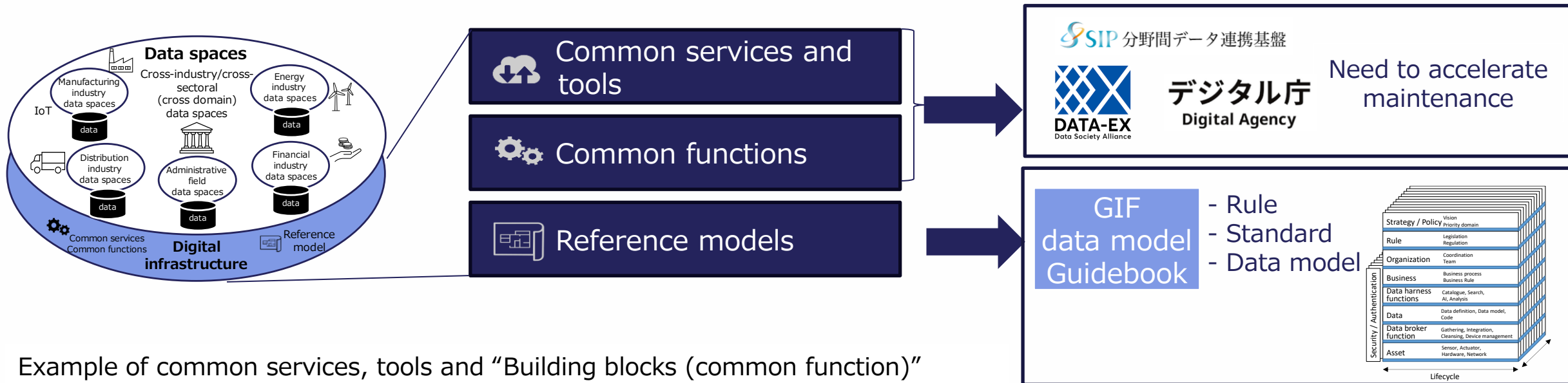
# Benefits of using connector

When developing data exchange applications, the provided connector can be used to **reduce the cost and time** required for design and development.



# Digital infrastructure

Digital Infrastructure provides common services, tools, functions, and reference models underlying the data space in addition to connectors.



Example of common services, tools and “Building blocks (common function)”

## 1. Data search

Data catalog
Data dictionary
Base registry
Market place

## 2. Authentication/ Authorization

ID service
Access control
Log management
Billing management

## 3. Data exchange

Connector
Broker
Delivery
Data management

## 4. Data utilization

AI/Analysis
Visualization
Knowledge Base

## 5. Development environment

OSS catalog
Test bed
Test data

## 6. Guideline

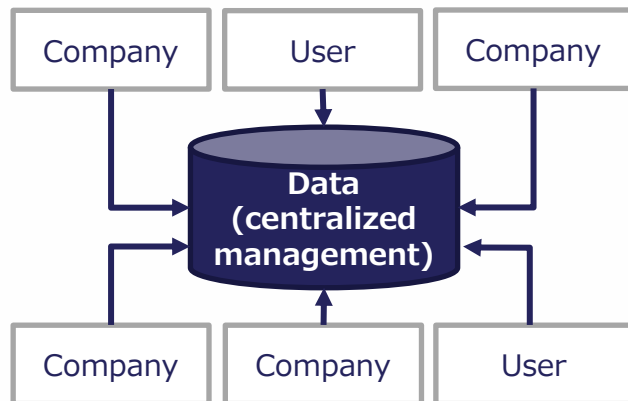
Knowledge
Teaching materials

# Differences from other data sharing structure

Comparing traditional data management and the structure of the data space is decentralized for reliability, interoperability, and data sovereignty \*1.

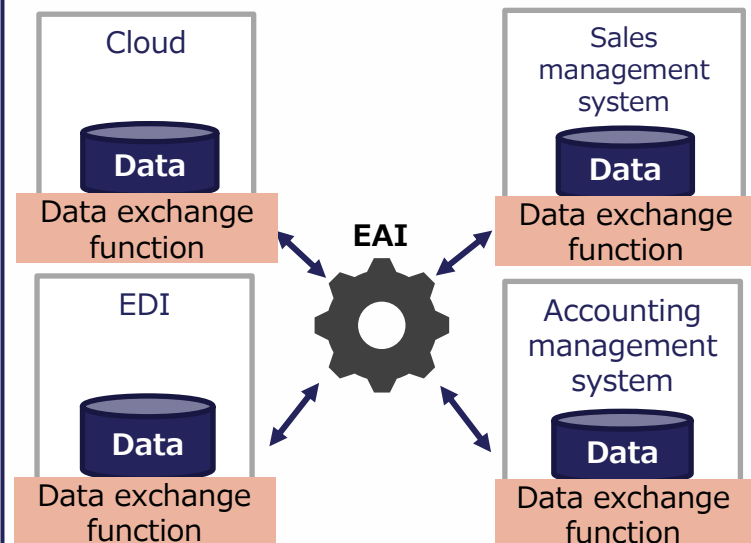
## Platformer type

Structure type	Centralized
Characteristic	Platforms hold & handle data.
Sovereignty	N/A
Example	Google



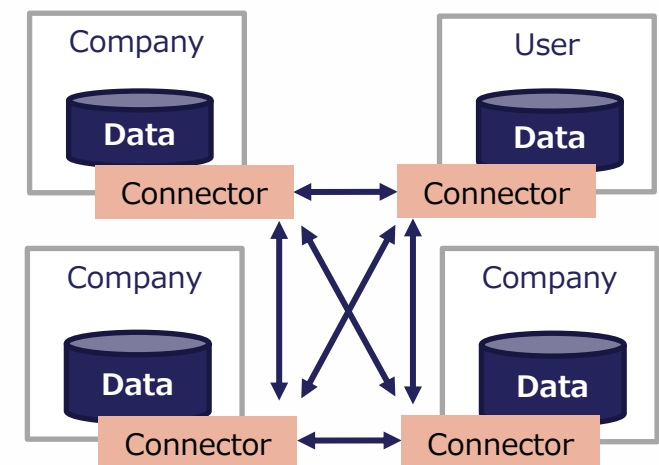
## EAI (Enterprise Application Integration) \*2

Structure type	Distributed
Characteristic	Mechanism for exchange data between systems within a company.
Sovereignty	N/A
Example	Data Spider



## Data spaces

Structure type	Federated
Characteristic	Can ensure reliability and share data between different organizations and countries
Sovereignty	Yes
Example	Catena-X



\*1: Whether or not the data provider can be involved in the handling of its own data.

\*2: System that links multiple systems used for business within a company to efficiently integrate data and processes.

# Role in acceralating data spaces in Japan

Government of Japan, DSA, and IPA plan to work together to promote data spaces.

<b>Policy/Strategy</b>	Vision, Scope
<b>Legal rules, Organization</b>	Laws, Regulations, Implementing agencies, Management organization
<b>Business, Function</b>	Using data spaces for services, solutions
<b>Data spaces</b>	Data space across industries and sectors Data space by industry and sector
Digital infrastructure ( framework, platform )	
Common service tools	Data catalog Dictionary, ID
	Development environment
Common functions	Connector access control
	Data utilization
Reference model	Technical rules data model, vocabulary
	Guideline
<b>Data</b>	Base registry Open data
<b>Assets (Equipment/System)</b>	IoT/Sensor, Hardware, Network

## Japan

### One Team

- Digital Agency
- Ministry of Economy, Trade and Industry
- Related ministries
- Information-technology Promotion Agency (IPA) \*
- National Printing Bureau \*
- Japan Institute for Local Government Information Systems (J-LIS) \*
- National Institute of Information and Communications Technology (NICT) \*
- Data Society Promotion Council (DSA)
- ...

\* Strengthening cooperation is stated in the priority policy program for realizing a digital society.

# Area of the data space

Data spaces are used in a wide range of fields in society.

In each field, one or more projects are underway, and there are many data spaces with limited functions or regions.

In Japan, there are many initiatives similar to data spaces.

Japan Standard Industrial Classification : Major Classification	EU	Japan
A. Agriculture, forestry	EDS agriculture	Semi-public (agriculture)
B. Fishery	Fishing	-
C. Mining, Quarrying, Gravel extraction	-	-
D. Construction	EDS construction	Smart buildings, Underground objects Land Transport PF
E. Manufacturing	EDS Industry / Industrial, Mobility	Intercompany transactions, Batteries
F. Electricity, Gas, Heat supply, Water industry	EDS energy	Water supply
G. Information and communication	EDS media	-
H. Transportation industry, Postal industry	EDS railway, mobility, aviation, shipping	Autonomous mobile robot Mobility (service)
I. Wholesale trade, Retail trade	-	-
J. Financial industry, Insurance industry	EDS Finance	Finance
K. Real estate business, Goods rental business	-	Land Transport PF
L. Academic research, Professional / Technical services industry	EDS cultural heritage	-
M. Accommodation industry, food service industry	EDS tourism	-
N. Life -related service industry, Entertainment industry	EDS tourism	-
O. Education , Learning support industry	EDS skills	Public Service
P. Medical care, Welfare	EDS health	Public Service
Q. Complex service business	EDS smart community	Public Service
R. Service industry (n.e.c.)	-	-
S. Public service (excluding those classified elsewhere)	EDS administration, Administration (law, procurement, safety)	Public personal authentication Public service
T. Unclassifiable industries	EDS green deal	CFP carbon footprint

# Case study (1) - Osaka City

## “Super city concept”



### Data spaces focus point

- Establishment of a digital infrastructure for industry-academia-government collaboration to eliminate the administrative digital divide within Osaka.
- The usage of the catalog enables the provision of services utilizing Osaka open data.

### Background

There was a disparity in efforts to utilize data among municipalities in Osaka Prefecture due to financial, human resources, know-how, and other limitations. Aim for a society where all residents can access advanced digital services.

### Effort

- Osaka Prefectural Government will take the lead in making ID sharing possible starting in FY2022.
- Establish a digital infrastructure and start providing services.
- Establish an environment to provide a variety of digital services to those who need them, when they need them.

### Effect

- Development of Osaka digital infrastructure  
-> 43 municipalities in Osaka can share the usage of data and services that were previously disparate or fragmented.
- ID sharing  
-> Enables services to be linked and can provide personalized services.
- Increased digitization of business operations improves operational efficiency.

### Expected benefits

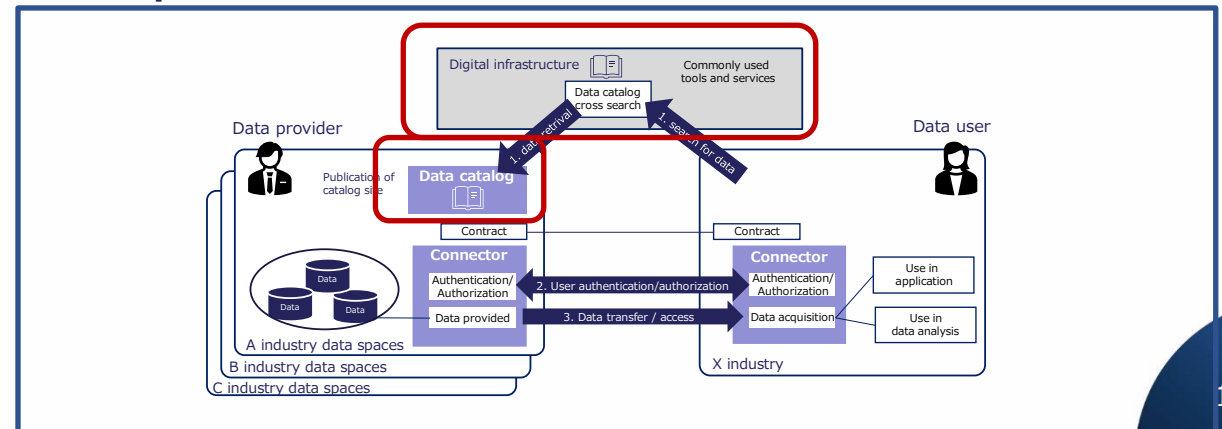
#### Business

1. Business speed improvement
2. New business development
3. Better marketing strategy, catch the detection earlier
4. Adding value to data owned by the organization
5. Improved data security and cyber attack countermeasures

#### Social

1. Sustainable society
2. Knowledge society / convenient society (utilization of digital technology)
3. Safe and secure society
4. A society with equality and less disparity

### Focus points of this case





# Case study (2) - Sapporo City "Marketing optimization"



## Data spaces focus point

- Establish of a digital infrastructure for public-private partnership.
- Possibility of creating new business by combining open data provided by private sectors with open data and provided by the Sapporo City.

### Background

The public-private partnership digital infrastructure for coordinated use of public and private sectors data in the Sapporo area is being built and consider full-scale promotion of data utilization.

### Effort

- Estate developers and restaurants combine external data such as "weather data" and "event data" from outside the Sapporo City to confirm the optimization of marketing and business operations.
- Conduct a demonstration experiment connecting CADDE connector to the Sapporo City's digital infrastructure.

### Effect

- Realize the optimization of marketing and business operations.
- By using the connector when using external data, there is no need to develop separate interface functions for data exchange.

### Expected benefits

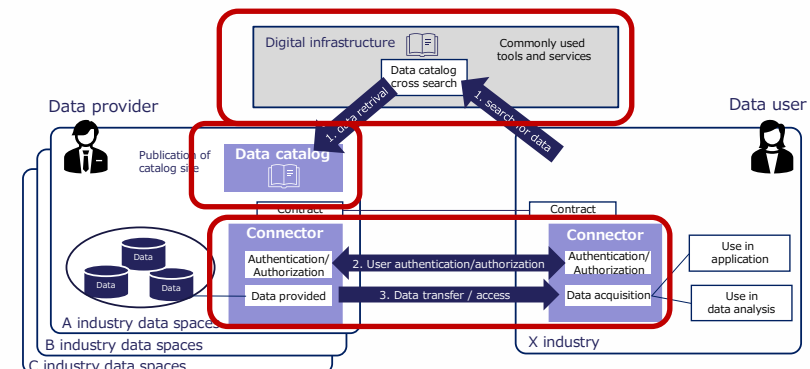
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#### Social

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### Focus points of this case



# Idea of business Case “Enhanced Marketing”

Understand consumer needs and improve marketing strategies.  
**Ensure credibility** and the ability to provide and obtain data.

## Effort

- improvement marketing strategy based on consumption information data that the manufacturer has not been able to catch before.
- Stores that previously refused to provide data on the grounds that the source of supply was unknown can now provide data because the reliability of the data is assured.

## Effect

- Manufacturer: Can catch up with consumer needs.  
 -> Leads to improve marketing strategy.
- Sales store: Data that had no value create business value.

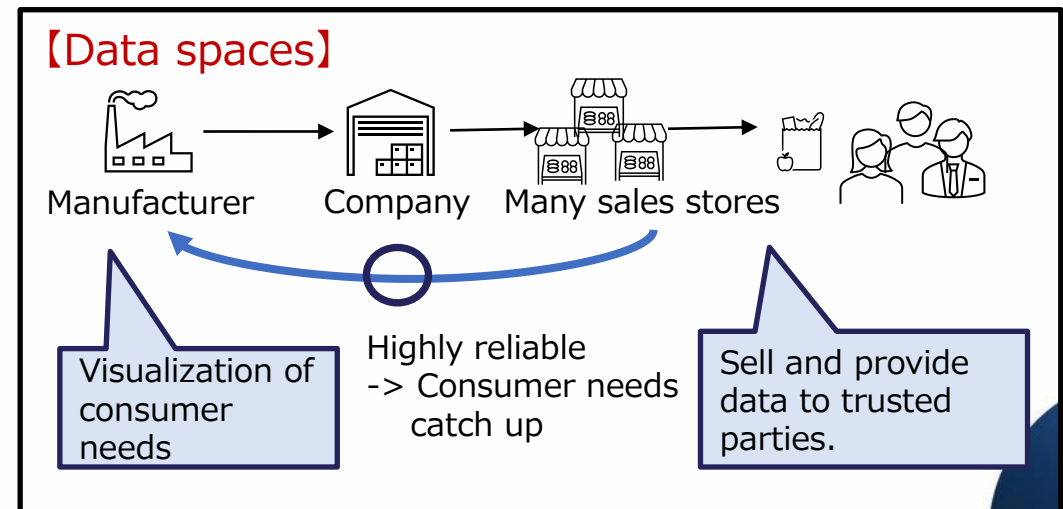
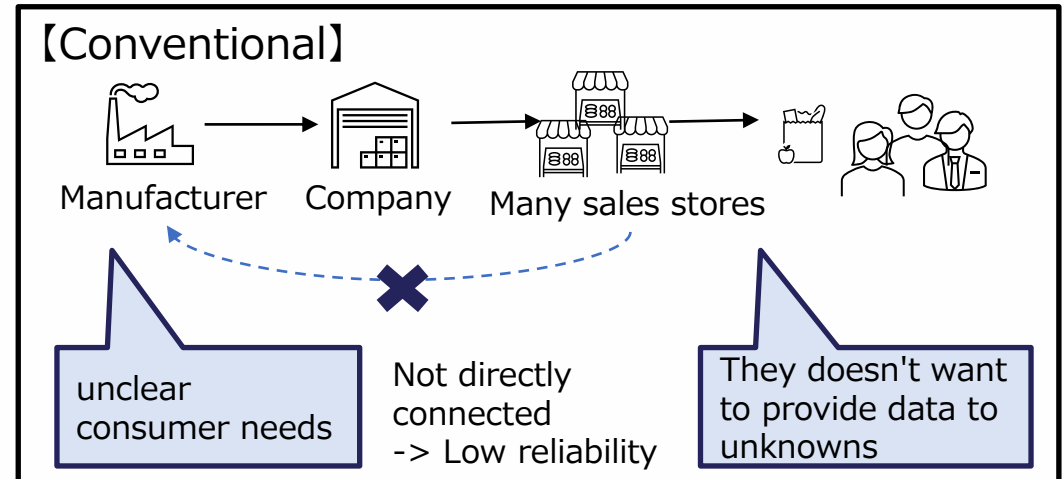
## Expected benefits

### Business benefits

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### 【Social benefits】

1. Sustainable
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## Inquiries

To promote data spaces, please contact us.

A large, stylized orange logo consisting of the letters 'IPA' in a bold, rounded font.

### Contact

A smaller version of the orange 'IPA' logo.

Information-technology  
Promotion  
Agency, Japan

Digital Infrastructure Center  
Digital Engineering Department  
Data Space Group

E-mail [disc-info@ipa.go.jp](mailto:disc-info@ipa.go.jp)