
Inter-company Data Linkage × Data Spaces

Executive Overview

Data spaces are an initiative to build a platform that combines systems and their supporting technologies to enable multiple organizations to freely circulate data while ensuring each other's reliability, thereby bringing about new spaces for economic and social activities. Data spaces play an important role as social infrastructure in achieving data sharing across supply chains toward realizing a decarbonized and resource-recycling society, as well as in creating innovative services between companies with different positions, industries, and even those in competition.

NTT DATA is involved with multiple data space businesses within and outside of Japan, working with customers who are facing hurdles in data linkage between government organizations, industry groups, and companies. This paper introduces the importance of this new digital social infrastructure, examples of initiatives, and future prospects, and discusses the potential of data spaces in the industries in which customers are involved.

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Chapter 1

Current state of inter-company data linkage

Data utilization is an absolute necessity for solving management problems and enhancing market competitiveness. In today's business environment, people are becoming more widely aware of digital transformation (DX) and increasingly promoting sophisticated management decisions and operational designs based on data. In such an environment, we will have more and more occasions where we aim to solve problems for industries/society as well as to create added value by not only properly managing and utilizing data within companies, but also sharing the data with necessary parties.



1.1. Industries requiring inter-company data linkage

Products and services are being developed and provided through collaborations among a number of companies in various fields, including manufacturing, energy, medicine, and education. In the course of such efforts, companies accumulate and manage various data that they can utilize in communications with client companies as well as dialogs with customers or the like, and sometimes share such data by request with authorities or the like supervising the industry, as necessary.

In recent years, demands based on regulations are becoming increasingly complex, such as data transfers between multiple companies in addition to data management by individual companies. For example, we are starting to see the trend in which the tracking of greenhouse gas emissions and raw materials or the like is mandated for multiple companies involved with product/service development and provision, in efforts to address social issues such as decarbonizing society and promoting a resource-recycling society. Companies that cannot respond to these demands may face penalties based on the law, reputational damage, or in some cases even discontinuation of business due to inability to release products into the market or conclude business contracts.

In addition to complying with laws and regulations that are becoming increasingly complicated, another factor that gives more weight to inter-company data linkage is the rising trend of companies cooperating to combine each other's data to spur innovation. For instance, smooth data sharing between different organizations is an absolute necessity in efforts to promote higher data-based efficiency and create new services, such as coordination of demand/supply between diversifying power generation companies and power consumers and provision of personalized medical/health services through collaboration between medical institutions and healthcare service providers.

1.2. New social infrastructure concept for data: “Data spaces”

In response to the increasing importance of inter-company data linkage, the concept of “data spaces” has been attracting attention in recent years. In response to the issue that inter-company data linkage is not being promoted due to lack of any suitable entities promoting the effort*1, data spaces are being promoted with policies mainly in Europe and Japan as a concept to build platforms for inter-company data linkage with better cooperation while aiming to achieve economical rationality for the benefit of overall society beyond the borders of individual companies.

The goal of data spaces is to bring about new “spaces” for economic and social activities, in which multiple organizations can check each other’s reliability and freely circulate data. Specifically, the aim is to support problem-solving and creation of new services based on data by establishing systems and IT infrastructures focusing on “connecting” multiple companies, rather than integrally managing data of individual companies using specific systems (Figure 1).

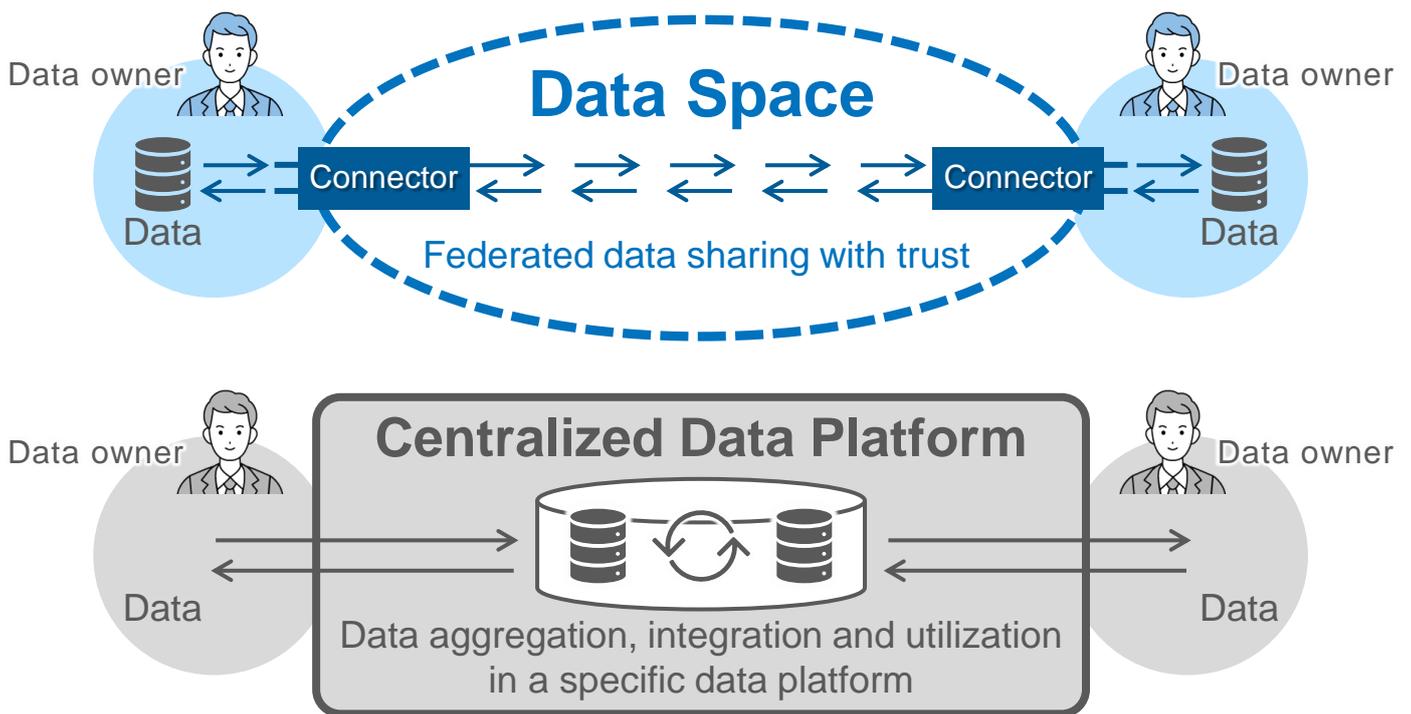


Figure 1: Data spaces and conventional data platforms

*1 There are hurdles with inter-company data linkage that involve consensus building among multiple companies and establishing security standards, making it difficult for efforts by individual companies alone to make progress. Furthermore, if multiple leader companies within one industry individually build their own platforms, the segmentation may result in disadvantages.

Chapter 2

Future realized by data spaces

A data space consists of multiple companies connected over a scope, such as a country, region, industry, or specific use case. Inter-company data linkage is promoted via the cooperative service provided on the data space. Data ecosystems develop through various data sources, including companies' own systems and external services or the like that they use, connecting with each other and advanced problem-solving and value-adding creation activities continuously being promoted. Data spaces are being promoted with the aim of making such a future a reality.



2.1. Reliable and free data circulation surrounding connectors

Companies that participate in data spaces to provide or receive data exchange necessary data with necessary parties through their own systems or services they use to transfer such data through something a “connector.” A connector is software that functions as the port for companies to exchange data with other companies, like end terminals in network lines.

Companies’ identifications are confirmed in advance when they participate in a data space via a connector.*² The process to negotiate/agree on rules, such as those involving use of data and handling of data after the exchange, is also provided as part of the connector’s functions.

Connectors are basic components that help companies ensure “data sovereignty” - that is, to control where their own data is managed and to whom it is provided for what purpose and under what conditions, on their own. As you can see, data spaces promote smooth data linkage by providing systems to secure the data sovereignty of each participating organization.

Most of the data space establishment efforts today are being promoted in the sphere of inter-company data linkage between a limited number of organizations and within specific domains, such as industries and countries. These endeavors ultimately lead to the concept of developing spaces where data can be circulated beyond the borders of specific domains, such as between companies belonging to different industries and companies involved with internationally-open supply chains. Entities of different countries promoting data spaces and international communities have been discussing demonstrations to connect different data spaces as well as to standardize technical specifications. In the future, we expect to see global data-sharing areas, which enable free data circulation beyond borders while protecting the data sovereignty of each country/industry/company.*³

*² As part of establishing the Digital Public Infrastructure, which is currently taking place in various countries, it is expected that the reliability of companies participating in data spaces will be further guaranteed by building a system to provide public digital identities to individuals and companies or the like.

*³ International discussions are underway with the aim of promoting data circulation beyond national borders, based on a concept called “DFFT (Data Free Flow with Trust).” Data spaces are recognized as one of the important initiatives to embody DFFT.

<https://www.oecd.org/en/about/programmes/data-free-flow-with-trust.html>

2.2. Expansion of services leading to data spaces

With data spaces being promoted in various industries, we expect to see IT services/solutions that respond to data exchanges via data spaces, and network infrastructures providing menus that help companies to participate in data spaces, which will make it easier for more companies to participate in activities in data spaces. One of the cases already being promoted is calculation services for greenhouse gases emitted through corporate activities. Services are being introduced that calculate/manage companies' internal emissions (scopes 1 and 2), which in turn enable calculations that include emissions of other companies (scope 3) connected through their supply chains by providing them with the function to exchange data with other companies on data spaces via connectors.

Chapter 3

Examples of initiatives by NTT DATA

Applying the expertise in data utilization that we have accumulated and our experience with establishing/operating cross-industrial cooperative platforms, NTT DATA is involved with multiple data space businesses within and outside of Japan. We are also continuously promoting technological development and demonstration projects in collaboration with other NTT Group companies*4, with the aim of providing data space participation services linked to IT services/solutions and network infrastructures and consulting services and so forth to customers in various industries.

This chapter will introduce representative projects in Japan and Europe, in which NTT DATA is involved, activities in international standardization organizations involving data spaces, and the R&D technology that enables handling of highly classified data between companies.

*4 NTT DATA is promoting the initiative to realize a global data linkage platform, on which data can be shared between different organizations or industries, along with NTT Communications and Nippon Telegraph and Telephone Corporation.

<https://www.nttdata.com/global/ja/news/release/2022/042701/>

3.1. Data space for automobile/battery supply chains

In May 2024, NTT DATA started providing the “Battery Traceability Platform” that can calculate/link product carbon footprint information during the manufacture of batteries fitted to electric vehicles among relevant companies. The aim of this platform is to respond to disclosures on CO2 emissions and resource recycling rates throughout the lifecycles of batteries, which are mandated by the Batteries Regulation enforced in Europe, by enabling data linkage among companies involved with battery lifecycles beyond the borders of countries. Utilizing the results of the function demonstrations that we have promoted together with the government and organizations or the like in the industry since FY2022, we are starting with providing a function to enable linkage of product carbon footprint information during battery manufacture between companies.

This platform was established as the first use case of the “Ouranos Ecosystem*5,” a public-private collaboration initiative aiming to realize the cross-country/industry data linkage platform proposed by the Ministry of Economy, Trade and Industry. The Ouranos Ecosystem has been promoted in multiple projects, in areas such as data linkage for supply chains and data linkage for spacial information for smart cities. Its aim is to be the data space system that can be widely utilized here in Japan as well as internationally by deploying it in various industries in the future. NTT DATA contributes to solving social issues and promoting industrial DX by activating inter-company data linkage through our continuous participation in the Ouranos Ecosystem activities, which is an important initiative for realizing data spaces originating in Japan.

*5 https://www.meti.go.jp/policy/mono_info_service/digital_architecture/ouranos.html

3.2. Leadership in data spaces in Europe

NTT DATA is involved with the design, implementation, and deployment of important components in the “Common European Data Spaces*⁶,” proactively contributing to the promotion of the European data strategy. NTT DATA’s European base possesses special teams for data spaces, semantics, digital identities, and trust frameworks, and participates in a number of major projects*⁷. In addition to our support for data space establishment covering many fields, we are also widely assisting efforts in terms of data utilization promotion through efforts such as developing a system for secondary data users in medical data spaces in Europe.

NTT DATA is also proactively promoting the development of "Simpli*⁸", an open-source middleware platform to support data access and interoperability among data spaces, in addition to the implementation projects of each data space in Europe.

*6 Common European Data Spaces is the general term for the efforts to realize data spaces in multiple fields of focus specified by the European Commission. As of September 2024, a total of 14 fields of focus have been specified, including manufacturing, agriculture, energy, mobility, and healthcare, and multiple projects have been organized.

<https://digital-strategy.ec.europa.eu/en/policies/data-spaces>

*7 Some of the representative examples of projects related to Common European Data Spaces, in which NTT DATA participates, are the European Tourism Data Space, the European Mobility Data Space, the Public Procurement Data Space, the Green Deal Data Space, CyclOps, Once Only Technical System (OOTS), and Towards the dataSetS for the European SEcurRty DAta Space for Innovation (TESSERA).

*8 <https://digital-strategy.ec.europa.eu/en/policies/simpli>

3.3. Standardization activities to achieve interoperability among data spaces

As initiatives involving “data spaces” in a number of fields are promoted in Japan and internationally, we can expect to see multiple types of technologies and system designs introduced as part of the structure to support inter-company data linkage, based on laws, industrial rules, use-case characteristics, and such. In order to simultaneously achieve the establishment of individual data spaces and data circulation beyond these borders, it is important for us to aim for a society in which data ecosystems using different systems are interconnected while respecting the inter-company data linkage systems of specific fields and use cases.

Based on such ideas, NTT DATA has been contributing to the establishment of standards/specifications required to link multiple data ecosystems through activities by international organizations involving data spaces. For instance, we are part of the activities for the “International Open Forum on Data Society^{*9},” an international roundtable established by the IDSA (International Data Spaces Association)^{*10}, which proposes the concept of data spaces in Europe and formulates technical specifications with the aim of international standardization, and multiple major Japanese and international organizations, including the IDSA. NTT DATA is applying its experience with establishing data spaces in Japan, Europe, and elsewhere to recommend what technical standards necessary to ensure interoperability between different data ecosystems.

We are also participating in projects to develop open-source software used to establish data spaces, and contributing to the development of data ecosystems also in terms of implementation. For example, we are aiming to improve quality by providing defect reports and patches to Gaia-X^{*11} providing trust frameworks, EDC (Eclipse Dataspace Components)^{*12} developed under the Eclipse Foundation, and Tractus-X^{*13}.

*9 <https://internationaldataspaces.org/>

*10 <https://iofds.org/>

*11 <https://gaia-x.eu/>

*12 <https://github.com/eclipse-edc>

*13 <https://eclipse-tractusx.github.io/>

3.4. Research and development to enhance confidentiality in inter-company data linkage

In addition to promoting inter-company data linkage through data spaces, NTT DATA is also promoting our own technological development to enhance the safety and freedom of data utilization by multiple companies on data spaces. This report introduces the “secrecy processing technology,” which enables companies to utilize data without disclosing trade secrets to third parties—even if such secrets are included in data and algorithms handled in inter-company data linkage.

NTT DATA’s secrecy processing technology provides an environment where users can only extract processed results, without the risk of disclosing any of the data provided by multiple companies or algorithms used to process combinations of such data to third parties other than the provider. In recent years, various technologies and services called Privacy Enhancing Technologies (PETs) and “privacy tech” have been introduced. In light of such development, the aim of NTT DATA is to provide end-to-end secrecy processing solutions that can fully conceal each other between all stakeholders throughout the entire processes from the point where data or algorithms are provided by multiple companies to the point where the processed results are delivered to users, rather than just the stage where data are processed.

The ability to use these systems in data spaces allows for linkage of data containing confidential information and such, the handling of which is still difficult even with the inter-company data linkage system. For instance, users will be able to perform statistical analyses conducted by competitors mutually bringing trade secrets together, or perform AI tuning while protecting the privacy of end users beyond the relevant companies, all in data spaces. Being able to secure the secrecy of algorithms used for data utilization can also help companies with data processing technologies to provide data processing services with high added value in data spaces, all the while protecting their know-how.



Some of the images used in this white paper have been edited from images generated by Microsoft Image Creator.

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