NTT DATA's Hybrid Cloud Managed Services
for Creating More Value
by Navigating Rapidly Evolving Cloud Technology Trends

NTT DATA

Trusted Global Innovator

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Introduction

"NTT DATA will optimize your IT environment and support rapid business creation by managing the increasingly diverse and complex hybrid cloud environment from planning to development and operations. "

The current state and future of the cloud market

Over the past few years, cloud computing has made its way into various industries and businesses, bringing convenience and improved security through numerous third-party certifications. At the same time, the size of the cloud market has grown every year and is expected to continue to grow. We believe the three key factors in the growing cloud market are (1) the mainstreaming of hybrid cloud configurations, (2) the growing cloud managed services market, and (3) the expanding edge computing market.

(1) Mainstreaming of hybrid cloud configurations
    In the cloud infrastructure market, we expect the public cloud market to grow significantly, while the private cloud and on-premise markets will grow modestly in line with overall IT market growth. The modest increase in the private cloud and on-premise markets is attributable to the fact that some systems cannot easily utilize the public cloud due to individual system requirements, such as operational requirements, non-functional requirements, or the need for specialized equipment. For systems that handle data that is critical to economic security, there is also a trend toward using a cloud platform that can be controlled within the country or by the company.
(2) Growing cloud managed services market
    The increasing use of various cloud services is expected to drive the need for more efficient management and operation of the entire system infrastructure. While there is currently a large market for IT outsourcing, in which the operation of IT systems is outsourced, we believe that this business will shift to cloud managed services as systems are moved to the cloud.
(3) Expanding edge computing market
    The use of cloud services has facilitated the consolidation of computing resources, but it has also raised issues such as data transfer latency, real-time processing of large volumes of data, and ensuring the security of sensitive information such as personal data. By using edge computing, which places computing resources at the edge, latency[1] can be reduced, large volumes of data can be processed in real time, security can be ensured by anonymizing confidential information, and the amount of data transmitted can be reduced. In addition, edge computing requires the use of the latest technologies that are highly relevant and compatible with cloud services, and we believe that both markets will interact and grow together.

Evolving cloud-related technologies

One of the key future technology trends related to the cloud is the shift toward decentralization. So far, the shift from on-premise to virtualization (private cloud) has led to partial consolidation, and the use of cloud services has led to further consolidation. Now, with the existence of multiple cloud services, and with on-premise/virtualization (private cloud) remaining due to individual requirements and economic security, there is a trend toward using hybrid cloud services, meaning, a shift toward decentralization. The expansion of edge computing is expected to drive further decentralization. If such a transition occurs, hybrid environments with edge computing will become the norm in the future, and customers will likely face the challenge of operating and managing an even more complex system environment.
NTT DATA also recognizes the importance of Hybrid Cloud Managed Services for effectively operating and managing hybrid environments that link disparate system infrastructures, xOps for operational visibility and continuous improvement, cloud service professionals who support these services, and the creation of a mechanism for unstaffed operations through Hyperautomation.

For these reasons, we believe that in addition to focusing on the three key factors related to the cloud market ((1) mainstreaming of hybrid cloud configurations, (2) growing cloud managed services market, and (3)

expansion of the edge computing market), NTT DATA should address the needs of operating and managing system infrastructures that have become diverse and sophisticated in architecture due to changes in cloud-related technologies.

Where NTT DATA is headed

NTT DATA will optimize your IT environment and support rapid business creation by managing the increasingly diverse and complex hybrid cloud environment from planning to development and operations.
The following are the three contributing factors.

1. The following technologies, in addition to those that have already been cultivated.
    ✓ Horizontal templates that support agility- and quality-driven development and are compatible with different architectures and Infrastructure as Code (IaC) automation for systems development in the cloud.
    ✓ Hybrid Cloud Managed Services for effectively operating and managing hybrid environments that link disparate system infrastructures, xOps for operational visibility and continuous improvement, and Hyperautomation for increasing business improvement agility by automating improvement processes.
    ✓ Sovereign cloud that ensures secure hybrid cloud management and data connectivity, ownership of data, software (systems), and operations within the country or by the company, and extremely high service levels for mission-critical systems.
    ✓ Edge GW for handling communications with various edge devices, edge computing resources for latency reduction and real-time processing, and Edge Cloud for security by anonymizing sensitive information.
2. More than 10,000 cloud engineers worldwide with cloud service expertise.
3. Partnering with cloud-related vendors needed to develop and operate hybrid cloud environments.

NTT DATA will continue to expand these capabilities, and in addition to supporting our customers' business expansion, we will provide new values to our customers and enhance the values provided.

[1] A data transfer indicator that shows the time delay between the transmission request and the actual delivery of the data.

01
Overall cloud market size and
three key factors
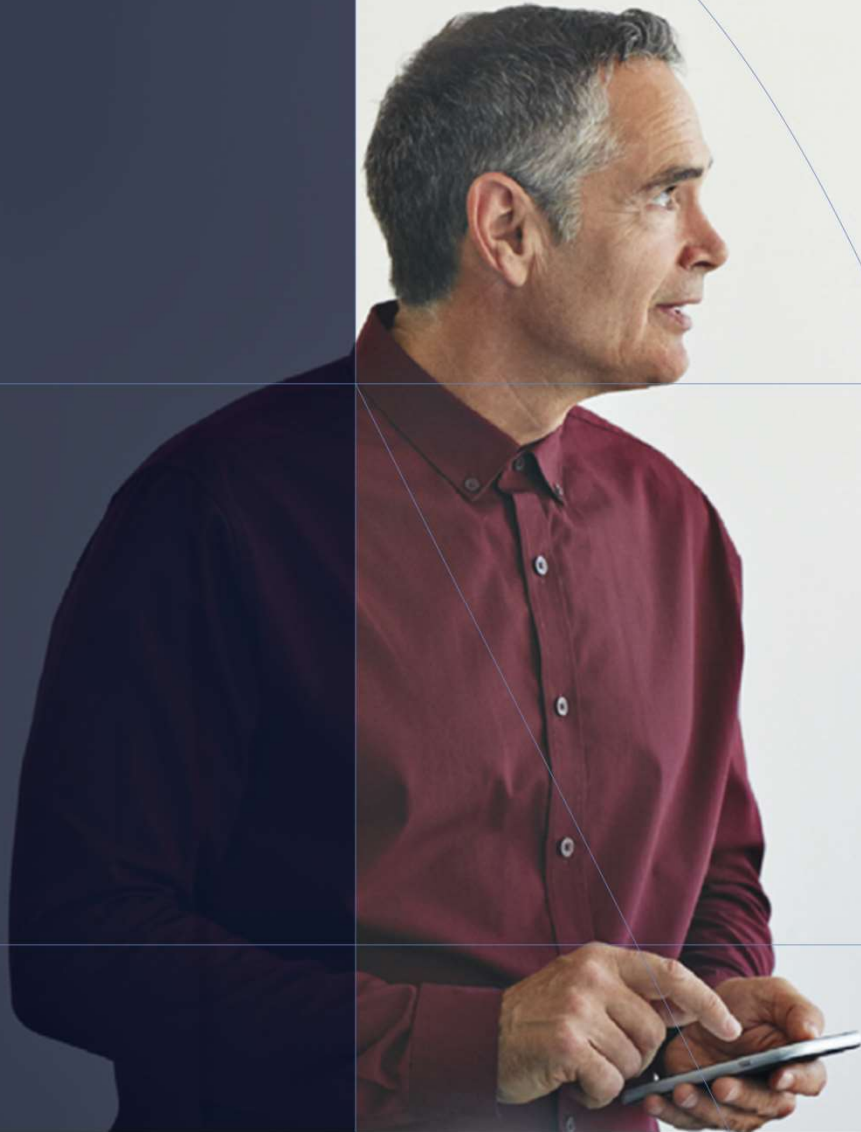
The cloud market is already a huge market, and as shown in Figure 1, it is expected to continue to grow at a compound annual growth rate (CAGR) of 4.1% from FY 2021 to FY 2026, reaching a market size of $276 billion in FY 2026. This growth rate is likely being driven by the increasing adoption and use of cloud-based technologies, such as machine learning, artificial intelligence (AI), and big data, as well as the inherent features of the cloud, such as greater convenience and improved security through numerous third-party certifications.

Here are three key factors that are expected to continue to drive growth in the cloud market.

Figure 1. Global market for cloud services and its growth rate[*1]

FY 2021	FY 2026
$226B	$276B

CAGR **4.1%**
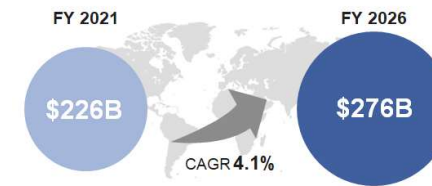
(1) Mainstreaming of hybrid cloud configurations

As shown in Figure 2, investment in cloud and traditional IT is expected to reverse by 2025, but this does not mean that the traditional IT market will shrink. Both architectures are expected to co-exist. The public cloud market is expected to grow significantly in the future, as the use of the public cloud, which provides easy access to the latest technologies, is becoming a common trend to expand business quickly in a volatile market. At the same time, however, there are some systems for which the use of the public cloud is difficult due to operational requirements, non-functional requirements, or system-specific requirements, such as the need for specialized equipment. There has also been a trend in recent years for systems that handle data critical to economic security to use cloud infrastructures that can be controlled within the country or by the company. These trends are expected to lead to small but steady growth rates for private cloud and on-premise services, and as a result, hybrid cloud configurations are expected to become more common.

Figure 2. Revenue projections from cloud shift[*2]

Sizing Cloud Shift, Worldwide, 2019-2025

Source: Gartner
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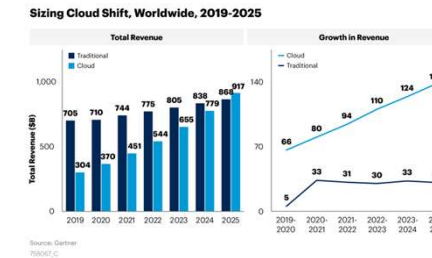
(2) Growing cloud managed services market

According to a Gartner® report[*3], "The cloud managed service market is forecast to reach $102 billion in 2025, growing at a five-year compound annual growth rate of 19.1% in U.S. dollars." This is because the importance of more efficient management and operation of the entire system infrastructure is expected to increase as the use of various cloud services expands in the future.

The IT outsourcing market, in which IT system operations are outsourced to a third party, is currently a large market, but this segment is expected to shift to cloud-managed services as systems are moved to the cloud.

(3) Expanding edge computing market

According to a Gartner® report[*4], "By 2025, more than 50% of enterprise-managed data will be created and processed outside the data center or cloud. " And in fact, on-premise infrastructures are increasingly being placed at the edge, not just in dedicated data centers.

By placing computing resources at the edge, companies can address the requirements to reduce latency, process data in real time, protect sensitive information by anonymizing it, and reduce the amount of data being transmitted. Widely distributed edge architectures are also considered to be highly interconnected and compatible with cloud services and will interrelate and expand together because they require extensive and low-cost connectivity between each location, and edge computing requires the use of the latest technologies.

One of the key future technology trends related to the cloud is the shift toward decentralization.

As shown in Figure 3, the shift from on-premise to virtualized environments has resulted in partial consolidation for each enterprise and user. The use of cloud services has further increased the concentration of multiple enterprise and user systems on a single platform. Now, with the existence of multiple cloud services and the continued need for on-premise/virtualization (private cloud) to meet individual requirements and for economic security, we are seeing a trend toward using hybrid cloud services and a shift toward decentralization.

In the future, the quest for faster value propositions will drive the expansion of edge computing due to the need for real-time processing. At the same time, the sovereign cloud, which addresses data sovereignty and legal requirements in an unstable international environment, will further increase both complexity and decentralization.

Our customers must adapt to the rapidly changing business environment amidst these technology transitions, and we believe that hybrid system environments that follow technology trends such as edge computing and sovereign clouds will become more common in the future.

Figure 3. Changes in cloud-related technology trends
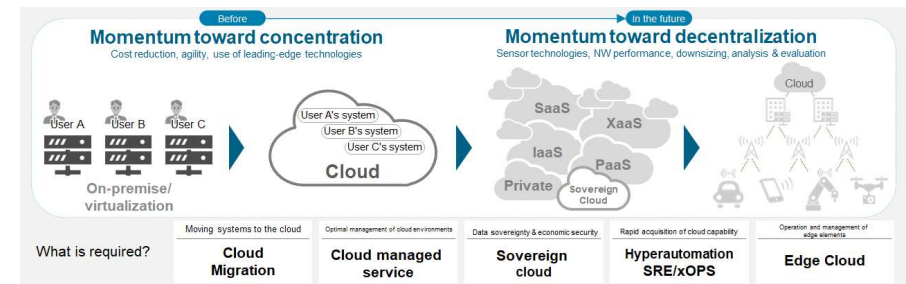
Considering the cloud market and technology trends, the challenge for our customers would be "how to efficiently develop and operate systems in an increasingly complex and diverse cloud environment and focus on their core business."

NTT DATA will provide a range of services and support to enable customers to focus on their core business by managing their increasingly diverse and complex hybrid cloud environments, from planning to development and operations.

To this end, NTT DATA will continue to strengthen its technology, people, and partnering efforts.

02
NTT DATA comprehends cloud technology trends

03
Value proposition offered by NTT DATA

NTT DATA will continue to provide a full range of services, from planning and other upstream processes to development, operation, and other downstream processes, and provide the optimal system infrastructure, including various types of cloud services and, in the future, edge services as appropriate. We will also work to (1) realize asset-based SI (service integration), (2) train and reinforce our cloud professionals, including Site Reliability Engineers (SREs), and (3) strengthen partnering efforts to meet the needs associated with the three key factors in the cloud market (mainstreaming of hybrid cloud configurations, growing cloud managed services market, and expanding edge computing market), as well as changes in technology.

Figure 4. NTT DATA's vision for the future
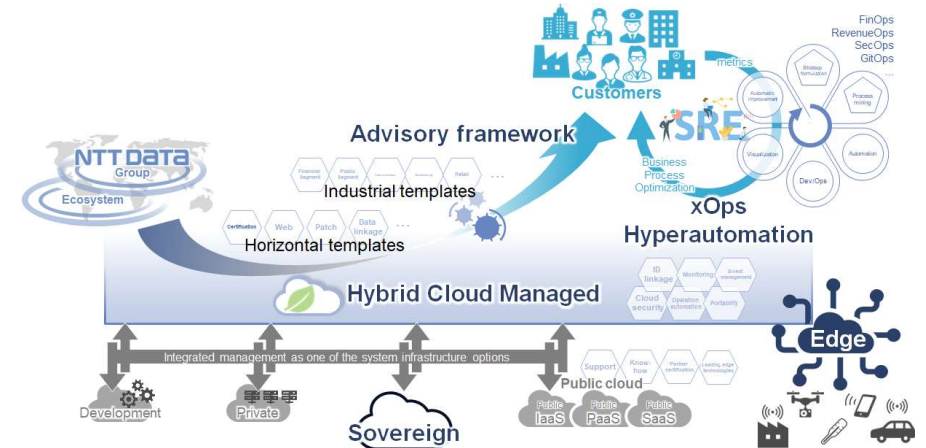
(1) Realizing asset-based SI

We will develop a platform that supports the shift from traditional systems development, which starts from scratch, to asset-based SI, which seeks total optimization.

We will also aim to increase agility and improve quality by providing Horizontal templates, which are a complete set of development deliverables required for cloud projects, including those prepared in upstream to downstream processes, as well as industry templates tailored to the specific characteristics of each industry. These templates will not only be combined for use in system development but will also be used to consolidate and manage assets. We will also use xOps and Hyperautomation to enable continuous improvement that can adapt to change, both automatically and unattended.

(2) Training and reinforcing our cloud professionals, including SREs

NTT DATA has a large number of multi-cloud professionals who are specialists in various cloud services, as well as cloud experts certified by cloud service providers, such as APN Ambassador and APN AWS Top Engineers in the case of AWS, MVPs in the case of Azure, and Google Cloud Partner Top Engineers in the case of Google Cloud, who are able to continuously provide the most suitable IT environment for our customers.

We are also working on training and strengthening our cloud consulting professionals to provide customers with a roadmap for building DX-driven IT infrastructures in the hybrid cloud and to solve their problems.

In addition to advanced cloud professionals and full-stack professionals with broad expertise covering the entire system from infrastructure to applications, we are also developing SREs who are able to examine business improvement initiatives at a high level, thereby supporting sustainable business growth.

(3) Strengthening partnering efforts

The two points above are being addressed quickly through increased collaboration with our partners. However, in order to cover more areas, we are not simply adding our partners' services and products to our portfolio. We are also looking for services and products that have a proven track record around the world and examining how they can be combined to provide services and products based on our knowledge and experience as a systems integrator.

Platforms that support the shift to asset-based SI

These are the five assets that are part of the platform that supports the shift to asset-based SI.

(1) Hybrid Cloud Managed

Hybrid Cloud Managed is a technology asset that provides managed services in hybrid cloud environments, enabling higher productivity and lower operational burden in these environments.
NTT DATA offers a range of services that provide comprehensive support for hybrid cloud environments such as a highly versatile managed service for the efficient operation and management of public and private clouds, a hybrid cloud managed service designed specifically for the industries, a real-time CSPM[2] service for the secure use of public clouds, and NTT DATA's highly reliable and secure cloud service. Together, these services support the secure and efficient development and operation of complex hybrid cloud environments.

(2) Horizontal templates

Figure 5 shows an overview of the Horizontal templates, which provide development and operational baselines optimized for each cloud and consist of the architecture bank, Implementation templates + IaC Tool Set, and operational templates, the features of which are described below.

Figure 5. Overview of Horizontal templates
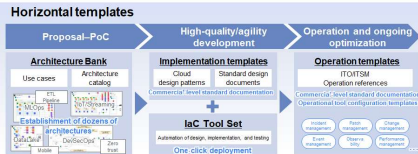
- Architecture Bank
  Various architectural models for the use of cloud services are maintained to provide our customers with fast and high-quality proposals and proof of concept (PoC) support.
- Implementation templates + IaC Tool Set
  Fast turnaround, cost optimization, and quality assurance for commercial development can be achieved by using implementation templates, including standardized cloud design documents, architectural models, and sets of various IaC tools and codes.
- Operational templates
  Standardized and efficient system operation is achieved through the use of operational tools and configuration templates to meet different operational requirements.

(3) xOps/Hyperautomation

Through advanced automation technologies, xOps and Hyperautomation enable continuous improvement without relying on the number or quality of workers, and are expected to be effective in de-personalizing cloud operations, optimizing the ROI of IT investments, and reducing operational costs and downtime.
The standardization of operations and the improvement and automation of operations using FinOps, AIOps, DevOps, etc., are mainly done with xOps, while AI, process mining, RPA, and other technologies related to Hyperautomation are applied to IT operations for advanced operational automation to enable further unstaffed operations and cost reduction.
xOps and Hyperautomation are in demand because, in addition to the lack of human resources required for cloud operations, the use of different services on different platforms and their frequent changes and updates, despite the growing complexity of the systems, consume more manpower and costs than ever before. Although automation has been partially implemented, it has not been able to keep up with the changes and updates, resulting in manual intervention.
NTT DATA will optimize cloud operations with xOps and further improve operations with Hyperautomation. These advanced automation technologies enable continuous operational improvements regardless of the number or quality of workers, allowing customers to focus on their core business.

Figure 6. From xOps to Hyperautomation

(4) Sovereign Cloud

A Sovereign Cloud is a cloud infrastructure that ensures the sovereignty of data, systems, and operations and is suitable for systems that require very high levels of confidentiality and maintainability.
Economic security and transparency are essential when using the cloud for mission-critical systems in the public and financial segments. The public segment, in particular, requires economic security for the storage of highly sensitive data.
In the US, cloud service providers such as AWS offer cloud services designed for government use (AWS GovCloud). This service is provided to meet specific government requirements, such as allowing only US citizens to operate the system, and is an example of how the US government ensures the sovereignty of the system's operation.
The EU launched the GAIA-X project in 2020, which aims to establish sovereignty and build the EU's own data infrastructure, in addition to the GDPR, which strictly regulates the removal of personal data outside the EU. Accordingly, sovereign clouds are being implemented in member states to ensure sovereignty. Cloud services provided by UKCloud (UK) and other organizations in the UK ensure sovereignty in the UK. In Germany, T-Systems (Germany) provides sovereign cloud services with technology provided by Google (US). In France, Thales (France), like T-Systems, has announced in 2021 that it will provide sovereign cloud services with technology provided by Google (US).

NTT DATA will meet the requirements shown in Figure 7 with sovereign clouds, providing a cloud infrastructure that can be controlled either by NTT DATA or by the customer.

Figure 7. "Sovereignty" that should be ensured with Sovereign Cloud

(5) Edge Cloud

The evolving and widespread use of various digital technologies, such as IoT and AI, is expected to create new businesses that utilize different types of edge devices. The cloud has been used to meet these needs, but as shown in Figure 8, there are challenges such as delays in data transfer, real-time processing of large volumes of data, security of sensitive information such as personal data, costs associated with sending large volumes of data, and operations required when the network is disconnected.

Figure 8. Challenges when using the cloud
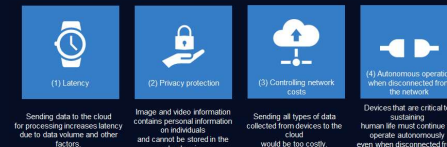
(1) Latency
When data is sent from an edge device to the cloud for data analysis and other processing, processing can take time depending on network conditions and data volume, resulting in high latency. Therefore, if real-time processing is required, processing must be performed at the edge.

(2) Privacy protection
Image and video data from cameras and other devices contain personal information on individuals. If such personal information and other sensitive data cannot be stored in the cloud, the information must be processed appropriately at the edge, for example by anonymizing it, and only the information that is necessary from a security perspective should be sent to the cloud.

(3) Controlling network costs
Sending all the data collected from devices to the cloud can result in very high network costs. In such cases, data processing should be performed at the edge so that only the minimum amount of data is transferred between the cloud and the edge.

(4) Autonomous operation when disconnected from the network
Edge devices, such as those related to medical care and human life, must be able to operate autonomously even when disconnected from the network. Appropriate processing should be performed at the edge to allow these devices to continue to operate autonomously in such situations.

Edge cloud addresses the above challenges and supports the creation of new businesses using different types of edge devices. Specifically, edge cloud addresses these challenges by providing multiple computing processing layers between edge devices and cloud services. Figure 9 is a case study of a connected car that achieves autonomous driving.

Figure 9. Case study of a connected car
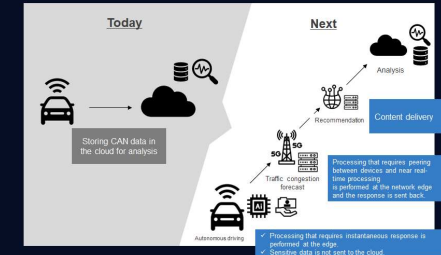
Automobile services have traditionally been delivered by storing and analyzing in-vehicle network data, known as CAN data, in the cloud. However, autonomous driving and other applications that require instantaneous response cannot be easily accommodated by traditional architectures and require the use of edge computing, where processing is performed at the edge. In a connected car, the car itself becomes one of the edge devices connected to the internet. Real-time processing and processing of sensitive data required for autonomous driving will be performed at the edge device (car), while data requiring near-real-time processing, such as traffic congestion forecast information, will be processed at the network edge, such as in a 5G network, and then a response will be sent back to the car. Content delivery, such as recommended advertisements shown on in-cab displays, will be handled by a content delivery network (CDN), while the analysis of information received from edge devices, the management of edge devices, and the delivery and management of applications to edge devices will all be performed in the cloud for centralized management.

Edge computing is essentially a means of connecting people, things, businesses, and organizations, and it can be combined in a myriad of ways, enabling a wide variety of edge computing use cases. For example, edge computing used in factories, edge computing used in retail facilities, and edge computing used in the connected car described above are all completely different.
NTT DATA's services cover the entire system configuration (e.g., distributed architecture that includes edge and cloud as well as infrastructure and applications) and the entire system development process from planning to development and operation to support the creation of new businesses that use edge computing.

# Training and reinforcement of cloud professionals

NTT DATA has a large number of experts available to ensure that our customers always have the best possible IT environment.

(1) Training of multi-cloud professionals and cloud experts

NTT DATA is focused on training cloud experts, each specializing in a specific cloud service, and multi-cloud professionals, who are proficient in different types of cloud services, and the company has more than 10,000 cloud professionals worldwide (as of September 2022).

Cloud experts are certified by cloud service providers as advanced cloud engineers and are designated as AWS Ambassadors, Microsoft MVPs, etc. NTT DATA employs one of the largest numbers of advanced cloud engineers globally.

Figure 10. Definition of multi-cloud professionals and cloud experts
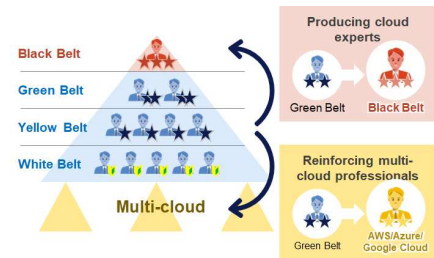
NTT DATA also hosts an internal community called the Cloud Architect Community (CAC), which brings together engineers from around the world who play a central role in the cloud business. This is a place where cloud experts from around the world can interact, learn from each other, and grow together while sharing the latest cloud-related technologies, insights, and know-how.

(2) Cloud consulting professionals

Expectations for IT systems are growing and becoming more complex, including the use of various cloud services and the maintenance and operation of existing systems. To support our customers, NTT DATA is committed to training cloud consulting professionals who can work with customers to explore ways to solve these issues by using a cloud service.

In addition, NTT DATA is working to prepare various cloud consulting assets that can be used in the IT strategy formulation and conceptual planning phases.

As shown in Figure 11, we have prepared cloud consulting assets based on NuCAF (NTT DATA Unified Cloud Adoption Framework) from various perspectives, such as cloud migration guidelines, security governance, and cloud-native development guidelines. Also, the recent strong interest in sustainability has prompted us to prepare assets such as Green Cloud Advisory, which focuses on the visualization and reduction of CO_2 emissions in the use of cloud computing, to help our customers solve their problems in the IT strategy formulation and conceptual planning phases through the use of cloud technology.

Figure 11. Overview of cloud consulting assets
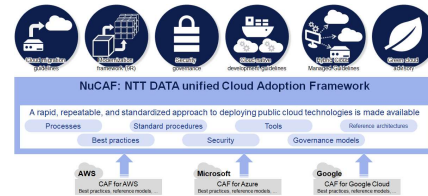
(3) Training of SREs

NTT DATA believes that the key to successful digital transformation is to have SREs who can "engineer site reliability" to ensure stable system operations and continuously improve system operations through automation and other software technologies.

Traditionally, each time we released a system, we made plans to fix any problems and test that the system was working properly. However, in a rapidly changing business environment, we need to continuously improve the released system by making the system status visible and analyzing the results. To do this efficiently, it is essential to use software technologies and save labor through de-personalization and automation, and SREs are needed to use these technologies while working on continuous improvement.

It would be better if our customers could retain enough SREs, but the reality is that it is difficult for them to find such personnel. NTT DATA is currently expanding the number of SREs who can support our customers' business innovation by leveraging their experience and knowledge in system development and operation, adapting to market and technology changes, and working closely with customers' businesses.

Figure 12. Values provided by SREs
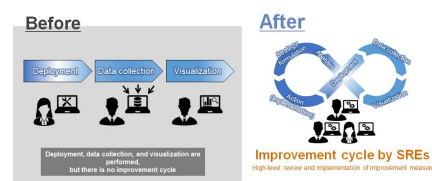
Partnering to expand service assets

NTT DATA is constantly expanding its partnership ecosystem with various technology companies around the world, exploring and verifying architectures and methodologies for the combined use of services and products provided by this diverse set of partner companies. Combining different services and products and ensuring that they meet the requirements and quality demanded by our customers requires a high level of expertise and experience. We believe that NTT DATA is able to appropriately identify and implement partner companies' services and products because of our extensive experience in building and delivering systems by combining such services and products from a wide range of partners. In today's rapidly changing business environment, systems must be released in a very short time frame, and NTT DATA believes that only by working with partners around the world can we achieve business agility.

Figure 13. Partnering with vendors in different business domains
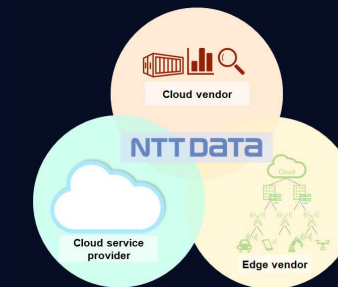
(1) Partnering with cloud service providers

NTT DATA is certified with the highest partner rating from major public cloud service providers such as AWS, Azure, Google Cloud, and Oracle Cloud. We also collect the latest information, continuously train cloud professionals, and further expand our cloud business by working closely with these providers through technical collaboration with advanced cloud engineers certified by the providers and cross-company strategic cooperation with AWS and Microsoft.

(2) Partnering with cloud vendors

NTT DATA is also working to partner with various cloud vendors, such as RedHat and VMWare, as well as cloud service providers. As a member of the Cloud Native Computing Foundation (CNCF), we are actively gathering information on the latest technology trends in cloud native computing and cloud-related vendors. We are using these partnering efforts to further strengthen our capabilities in xOps, Horizontal templates, Hybrid Cloud Managed, and other areas.

(3) Partnering with edge vendors

The edge computing business is expected to grow and become a very large market in the future, but the market is not yet mature, and we are still at a stage where many enterprises are releasing edge-related services and products on a daily basis. As described above, there are many different possible use cases for edge computing. NTT DATA will identify edge-related vendors that can provide the necessary functions and services according to the use cases, and together with our partners, provide the necessary elements as a whole, from infrastructure to applications, from devices to cloud services.

Sources

- *1
  Graph/Chart created by NTT DATA based on Gartner Research, Calculations performed by NTT Data.
  Source: Brandon Medford, Colleen Graham, Craig Lowery, Scot MacLellan, Market Opportunity Map: Cloud IT Services, Worldwide (Gartner, Inc., September 16, 2022)
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  Source: Michael Warrilow, Colleen Graham, Ed Anderson, Market Impact: Cloud Shift — 2022 Through 2025 (Gartner, Inc, January 2022 7, 2022)
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  Source: Brandon Medford and Colleen Graham, Forecast Analysis: Cloud Managed Services, Worldwide (Gartner, Inc., October 11, 2021)
- *4
  Source: Thomas Bittman, Bob Gill, Tim Zimmerman, Ted Friedman, Neil MacDonald, and Karen Brown, Predicts 2022: The Distributed Enterprise Drives Computing to the Edge (Gartner, Inc., October 20, 2021)