

# Digital Store Platform, an Information System Platform for Smart Retail CX

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## Abstract

NEC Corporation enables the retail industry to integrate and manage disparate data from which to identify behavioral tendencies and situational factors that can be used to make smart, timely suggestions to shoppers. In addition, we also provide attractive shopping experiences tailored to each shopper in both an online and offline context. These services are made possible with Digital Store Platform, a retail domain-oriented platform capable of providing information from disparate data in real time no matter where the data is stored. With this platform that provides a prompt and low-cost means to respond to ever-changing customer needs, we aim to contribute to the development of the retail industry.



Microservices, API, OMO, register-less, Grab&Go, Scan&Go, digital shift, post COVID-19

## 1. Introduction

Despite e-commerce, SNS, 5G and artificial intelligence (AI) driving forward the digital economy, the Japanese retail industry has been lagging behind other industries in shifting to digital.

In the future, the barrier between networks and the real world will vanish and open into an after-digital era in which the online and offline are fused through various devices. This paper introduces the approach taken by NEC to support acceleration of a digital shift in the retail industry.

## 2. NEC's vision based on the Digital Store Platform

The information system platform plays a very important role in actualizing the vision expressed in Smart Retail CX: delivering comfortable customer experiences achieved through effective store management and a stimulating work environment in which employees feel a sense of fulfillment.

Without a well-arranged platform, it would be impossible to develop apps quickly, support safe store

operations, improve customer experience and provide convenient operational environments.

An information system platform that can support the above is what the Digital Store Platform is. NEC believes that, to implement such a platform, data transparency, real-time data acquisition and compatibility with a variety of devices are the three most critical points (**Fig. 1**).

### 2.1 Data transparency (data usage requiring no conscious thought about storage locations)

Now that the use of the cloud has become the mainstream for building systems, the mechanism that allows data users (developers) to be unconscious of data storage locations has become the first point required for platform implementation. Past approaches to data management in the retail industry have often used architectures that determine the functional layout based on the consciousness of data storage locations, such as integrated management in the center or a cloud and local management inside the store. However, in addition to the diversification of handled data from structural data such as that of the Relational Database

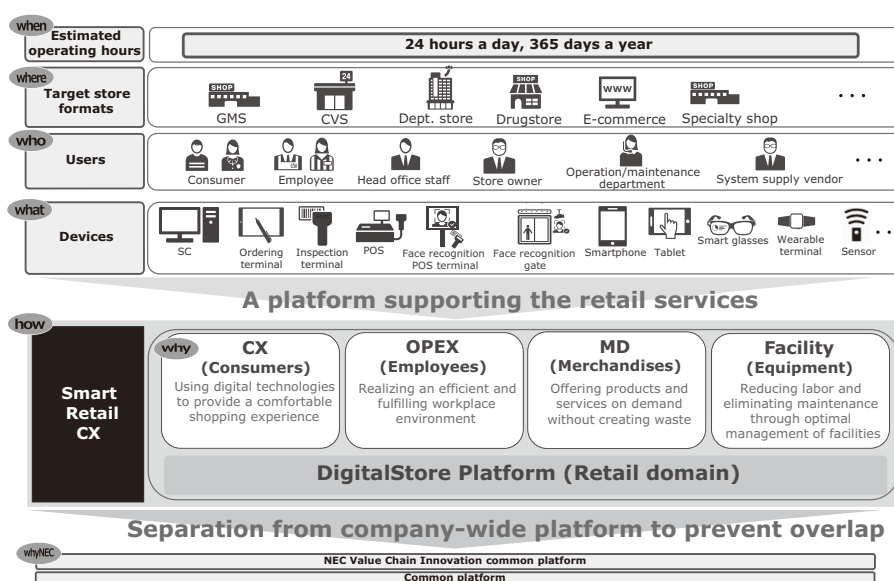


Fig. 1 Positioning of the Digital Store Platform, a platform for implementing NEC Value Chain Innovation in the retail domain.

Management System (RDBMS) to video, audio, aggregated data and social media data, the quantity of data is increasing steadily. Under such circumstances, the mechanism that stores data itself in an easy-to-manage location and allows the data users to use data by means of API calls, without consciousness of data storage location, has been increasing in importance.

### 2.2 Real-time data acquisition (acquiring necessary data at necessary timing)

To provide the customers and employees with the required information in real time, a mechanism capable of instantaneous data provision is important. The second point is therefore to provide a mechanism and platform that enable free, easy and safe acquisition of various kinds of data at the required timings.

### 2.3 Compatibility with diverse devices

Until only a few years ago, the mainstream of store systems had been built using dedicated equipment including point of sales (POS) systems and order-dedicated devices such as graphic order terminals (GOT), which caused the retail industry to be left behind the admirable progress of devices in the recent IT market. Meanwhile, the amazing improvement of the functionality of universal devices such as tablet terminals, smartphones and smartwatches has been increasing the use of various devices in

business operations. In addition, the opportunities customers have to access store information through the Bring Your Own Device (BYOD) terminals are also increasing and the IT transition of OT equipment such as refrigerators and electronic shelf labels is also advancing. A mechanism that enables flexible use of the functionalities of diversified devices is also important, so a platform capable of easy development and operation of such functionalities becomes the third point.

The world aimed at by the Smart Retail CX can be implemented by providing an information system platform that can support the three points above.

## 3. API Platform Making Data Users Unconscious of Data Management Location

As retail systems in the past had often been based on information system platforms built in the era with poor hardware resources, their functionality and data layouts often prioritized the display performance in the field. While data is stored in each location, the security considerations have often permitted only data referencing in the local environment, in which case real-time data acquisition from outside has been impossible. More recently, however, the advancement of networking technology as represented by 5G and Wi-Fi6 and the drop in the server resource cost are accelerating the growth of external information system platform environments that will not cause performance problems even in case data is distributed and referred to in real time from external systems where data is originally

generated. Also, diversification of data and increase in data use through the Internet such as social media use are making it more convenient to use a platform that can collect and provide data through the API without making the data users conscious of the storage locations. The key technical elements for meeting this need quickly are the microservices and API. The following sections introduce the microservice and API efforts made at NEC by taking the Customer Experience (CX), Operational Excellence (OPEX) and Online Merges with Offline (OMO) as exemplar cases.

### 3.1 Platform supporting register-less store (CX)

While the checkout formats are subjected to strong needs of diversifying such as register-less stores, self-checkout, food vending machines and electronic cart (EC), the cash registers used in the current retail industry still often employs the device-local functions and data by considering the business continuity in case of disasters and the display response. The data handled by the cash register can roughly be classified into the following three types:

- (1) Master data including price information and sales promotion data
- (2) Accounting data including sales, settlements and consumption tax data
- (3) Inventory change data resulting from sale and merchandise returns

All of the data above require linkage with the mission-critical system, but the huge number of patterns tend to complicate the logics. If they are packaged

individually for each checkout format, the increase in the development costs cannot match the benefits. This becomes one of the causes setting a high bar to the introduction.

To deal with the above, the Digital Store Platform classifies the checkout APIs, including the functions for the data exchange/linkage with the mission-critical system, price calculation, sales promotion judgment, settlement and recorded sales, and adopts microservices to achieve a loosely coupled function granularity. We place them in the cloud and enable referencing from various devices and checkout formats, so that the costs and period of development can be reduced and services can be provided more quickly to the customers.

Instead of scanning the merchandise barcodes, register-less stores are implemented by calculating the price using the checkout APIs that use the merchandise barcodes as the key, based on the behavior information of the merchandises taken out of shelves.

In addition, when the newly generated behavior information data is combined with the mission-critical system data, it will be possible to provide new services that can serve analyses and marketing (Fig. 2).

### 3.2 Platform supporting outside ordering (OPEX)

One of the operations at a store is ordering. The ordering action presupposes the usage of devices while checking the shop environment such as products layout, sales conditions etc., so data and functions are placed on store-dedicated devices in many cases. Ordering consists of operations that use various kinds of data

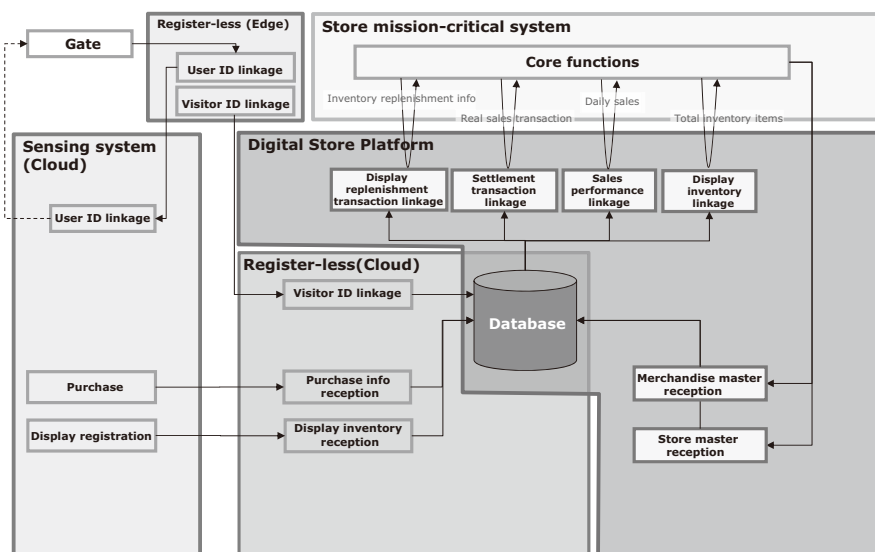


Fig. 2 Platform supporting the register-less stores.

including the merchandise master, sales performance, weather and sales promotion data. It employs an architecture that places importance on the display response in order to secure the convenience of users who have to handle a large amount of data. However, it cannot be denied that the real-time property and the improvement of convenience by using other devices should be sacrificed as its tradeoff.

However, the need to assure business continuity from outside the store in the same way as from inside is recently rising as an under/post COVID-19 countermeasure. As one of the solutions to this need, NEC is arranging the Digital Store Platform by packaging the APIs for acquiring local data of the store in the platform so that the business can be continued with real-time acquisition of data from outside the store, which used to be available only from inside the store. There are two key points for the implementation of the APIs.

The first point is to define the APIs with the function granularities that considers the use of microservice for each data type. This is a totally different policy of the previous method for which the functions are set to match the display layout by prioritizing the display response. This point makes it possible to deal with changes in the UI requirements depending on devices used and scenes of use by changing only the UI without changing the APIs.

The second point is to design the system presupposing a multi-step call structure, which calls the data acquired

by the APIs after aggregating them without making the users conscious of the data storage locations. This allows the data users to acquire necessary information easily in real time.

The mechanisms described above enable speedy building of new ordering systems such as one using tablet terminals from outside the store or one that utilizes data on the Internet including social media.

### 3.3 Platform presupposing changes in the OMO era

In the traditional retail industry, the main points of contact with the customers have been the store fronts where the purchase behaviors of customers take place, but also included the consumer lock-in using social media, guiding to EC sites and guidance of online customers to real-world stores using O2O.

However, as expansion of the digital market has recently made the boundary between the cyber and physical domains unclear, making their linkage more seamless, the customer touchpoints (the space where active interaction with customers appears) are also diversifying and the real-time property for providing optimum information to customers at the times they need it is increasing in importance more than ever.

In the environment in which 5G is a matter of course, it can be expected that the next-gen devices to the smartphone will become the mainstream. To deal with such a possibility by tracing flexibly the diversification of access devices, the platform is required to fill the

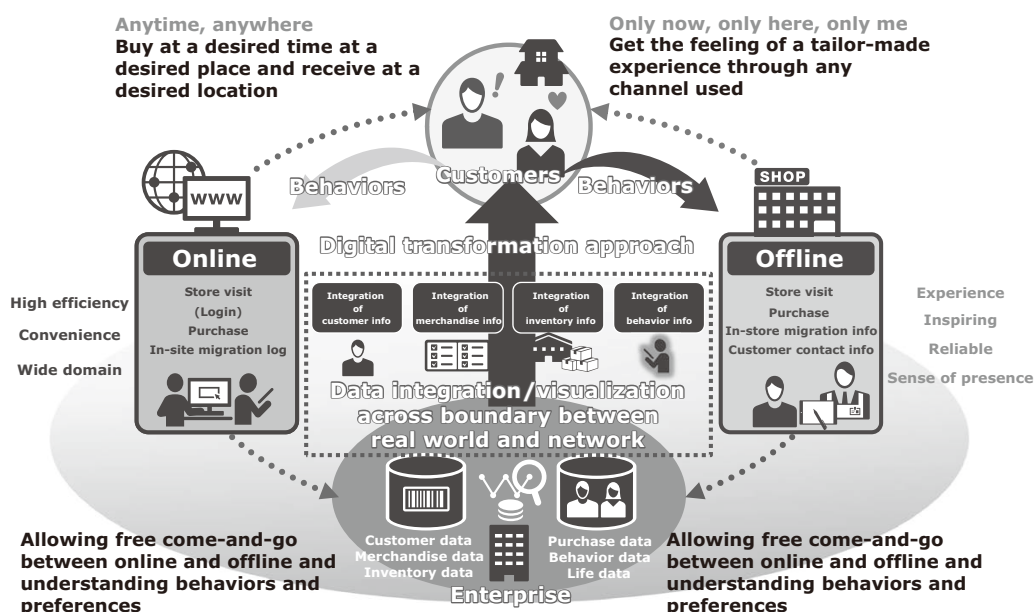


Fig. 3 Desirable shape of OMO era to come.

following requirements.

- Flexible display construction making use of the Contents Management System (CMS), etc.
- Responsive design for flexible tracing of sizes
- Component basis for loosening of inter-function coupling
- Microservices for optimum function granularity
- Architecture capable of flexible incorporation of XaaS
- Security design presupposing Zero trust (ZT)
- Communication platform enabling seamless info exchange between developer and operator
- DevOps platform facilitating linkage between the development and operation departments at service updating

The Digital Store Platform is organized to provide an information system platform with consideration of the requirements above (**Fig. 3**).

#### 4. Conclusion

It is because the current times are undergoing sharp changes that building of architectures and systems presupposing changes are required. NEC is determined to continue support for the retail industry by providing the system platform that can facilitate the use of rapidly diversifying data while flexibly accommodating new technologies, devices, development techniques and services that are evolving constantly.

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The details about this paper can be seen at the following.

#### Related URL:

**Smart Retail CX (Japanese)**  
<https://jpn.nec.com/nvci/retail/index.html>

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