Fujitsu's Leading Platform for Digital Business

● Noriyuki Nakamura

In recent years, new digital technologies have been introduced into our business and social environments, causing a major change that is recognized as the digital transformation. To better adapt to this trend, in 2015 Fujitsu launched FUJITSU Digital Business Platform MetaArc (hereafter, MetaArc), designed to integrate the latest information and communications technologies (ICTs) such as cloud computing, mobile technology, big data (analytics), the Internet of Things (IoT), and artificial intelligence (AI). MetaArc is a platform that realizes a seamless collaboration between two kinds of systems—those that create new innovations through connecting people and the physical environment (Systems of Engagement, or SoE) and those that enhance the efficiency of enterprise systems (Systems of Record, or SoR). Together, they make it possible to respond to changes in the business environment quickly and flexibly. MetaArc also offers a series of products useful for making a business grow. This paper introduces FUJITSU Cloud Service K5, the core cloud platform for MetaArc. It then outlines the platform's various component services and products and describes our cloud-centered strategies and efforts to maximize the value provided to our customers.

1. Introduction

Digital technologies such as cloud computing, mobile technology, big data (analytics), the Internet of Things (IoT), and artificial intelligence (AI) are rapidly penetrating society and becoming a part of our daily lives in various forms. For example, it is already a commonplace activity to connect to the Internet with a mobile device such as a smartphone to communicate with others via a cloud-based social media service or to shop online while referring to automatically presented recommendations. These technologies are making people's lives more convenient, comfortable, and enjoyable, but at the same time, they are also revolutionizing conventional business models by providing new and unprecedented value. They underscore a further acceleration of the "digital transformation" in which a wide range of industries are increasingly adopting digital technologies and rewriting principles of competition and conventional business formats.

For example, Uber, which has made a car-dispatching mechanism that matches providers and users by smartphone into a business, has already had a major impact on the taxi industry. Airbnb, meanwhile, has become a threat to the hotel industry by making a business out of a mechanism that turns empty rooms in private homes into lodging for travelers. There are also innovative developments in *monozukuri* (manufacturing) using sensors and IoT, in customer service using big data collected from diverse channels such as the Web and social media combined with AI, etc. All in all, a wide variety of services associated with the digital transformation are being created in rapid succession.

These movements are promoting the entry of new players unconstrained by existing industries and business categories. They are driving the full-scale launching of new businesses using information and communications technology (ICT) in a form involving startup companies and major firms throughout the world.

Against this background, the target of system investment in the corporate world is undergoing a paradigm shift. It is moving from a domain that seeks to increase the efficiency of existing business processes and operations under the leadership of the information

systems department to a domain that aims to recognize diverse needs beforehand at the front lines of business and create and provide new value for customers appropriate to the digital business age.

Amid these changes, Fujitsu has undertaken the development of a cloud-based platform to maximize the use of digital technologies for business growth and to achieve a genuine digital transformation together with its customers.

In this paper, we begin by describing system requirements in the digital age. We then introduce FUJITSU Digital Business Platform MetaArc (hereafter, MetaArc) for achieving a digital transformation and Fujitsu's efforts in maximizing the provision of value to customers.

2. System requirements in the digital age

In this section, we try to determine what kind of information system is needed in the digital age from a technical point of view.

In a world in which all sorts of things are coming to be digitally connected, ICT is becoming all the more important as an indispensable means of driving business forward. This trend is deeply related to the shift that is now taking place in the core use of ICT, from systems that emphasize the recording of business transactions (Systems of Record, or SoR) to systems that actively engage with people and things to create new value (Systems of Engagement, or SoE).[1)]

In more detail, SoR refers to a group of systems that mainly support a company's mission-critical business systems such as accounting, production, and sales in which stability and reliability are vital. A company that wishes to survive amid major changes in the management and business environment must strengthen the ability of its systems to respond to change while reforming its structure to enhance business agility. Fujitsu calls this process "system modernization." This means increasing the mutual independence of the system's components and functions by making them loosely coupled and modular. Visualizing and minimizing the range of impact when modifying a system and acquiring agility through modernization must be applied to SoR.

On the other hand, SoE refers to a group of systems that facilitate mutual engagement and interaction among general consumers and on-site business users through the use of social media services and mobile devices. The aim here is to foster innovation in current business processes, create new products and services, and form ecosystems that extend beyond the company. However, for new lines of business with no exemplars, it is difficult to solidify requirements in the system planning stage. It is therefore imperative that Proof of Concept (PoC) demonstrations and system development based on an agile methodology be conducted in that stage.

Although we have been talking about SoR and SoE as if they were completely independent, they must be linked to achieve a genuine digital transformation. We can envision a number of scenarios that reflect the need for such linkage, such as interaction with mission-critical business systems via mobile applications, innovation in *monozukuri* by combining sensor data and production management information in the manufacturing industry, and innovation in customer service by combining consumer behavior information and customer management information in the financial and retail industries.

Furthermore, new ways of dealing with each type of system must be considered when linking SoR and SoE. For SoR, technologies, data structures, and user interfaces often differ from system to system, so the linking of individual systems by mutually comparing specifications can result in a complicated system structure. It is thus important to adopt a service-oriented architecture (SOA) approach and technology-oriented encapsulation (the formation of service application programming interfaces [APIs]) and to separate applications and data through a data integration platform that absorbs differences in data structures. Furthermore, separating the rules and processes that are directly implemented in application source code from business logic is an effective way to achieve a simple structure with high maintainability.

Additionally, we can envision in SoE the need for building applications using a mashup method, such as by combining externally provided service APIs, mobile devices, and input data from sensors as needed. Using API management (provided by a virtual gateway) that provides a protocol for each API and function such as billing, load balancing, and activity monitoring, is an effective way of dealing with the complicated calling

of diverse APIs. Moreover, once requirements covering data synchronization, data volumes, etc. have been clarified in data linking between SoR and SoE, it will be necessary to design linking functions that take online-batch-processing attributes into account and that discriminate between various types of processing methods such as file transfer, database sharing, and database replication.

Given the mutual interaction between SoR and SoE described above, it is vital that the information systems of the future be agile in the face of change while remaining compatible with external services. Consequently, in addition to a mechanism that enables prompt and easy construction of SoR and SoE, future information systems must provide a mechanism for seamlessly linking the two types of systems plus an optimization mechanism that enables both types to continue growing and expanding.

3. Fujitsu's efforts toward customer digital innovation

Fujitsu has been providing MetaArc as a service and product group since 2015 as a springboard to a digital transformation to be achieved together with Fujitsu's customers (**Figure 1**).

MetaArc, the digital business platform provided by Fujitsu, consists of an extendible cloud-computing platform and a variety of services and products powered by cutting-edge ICT such as advanced mobile, big data (analytics), IoT, AI, and security. In addition to cloud services, MetaArc provides products for creating private clouds, integrated platform services based on usage scenario and purpose, multi-cloud integration and managed services for mutual linking and operation with other vendors' clouds and services, and alliance partner services (**Figure 2**). The above services and products can also be combined in a mashup so that a customer using MetaArc can easily and quickly develop and provide the applications and services needed for its digital business.

Furthermore, by building co-creation relationships with a variety of service providers and worldwide developers and creating a mechanism for naturally merging useful technologies, services, and knowledge, Fujitsu aims to support the stable and ongoing growth of its customers' digital businesses.

MetaArc can be combined with FUJITSU Knowledge Integration, which makes use of organized and systemized knowledge in the form of industry/business know-how and system development/operation know-how accumulated by Fujitsu through many system integration (SI) experiences. This combination of

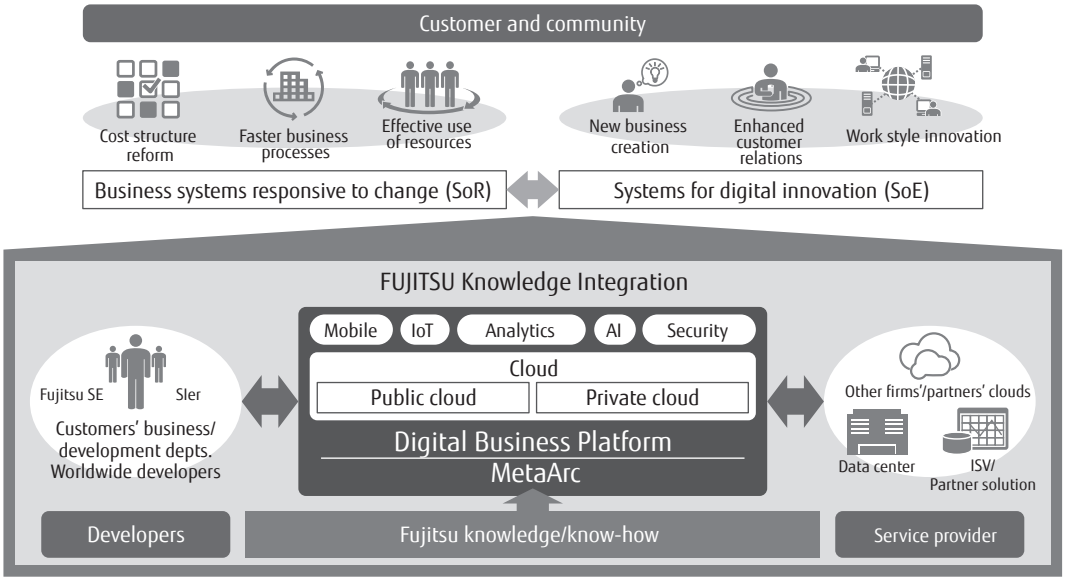

Figure 1
FUJITSU Digital Business Platform MetaArc.

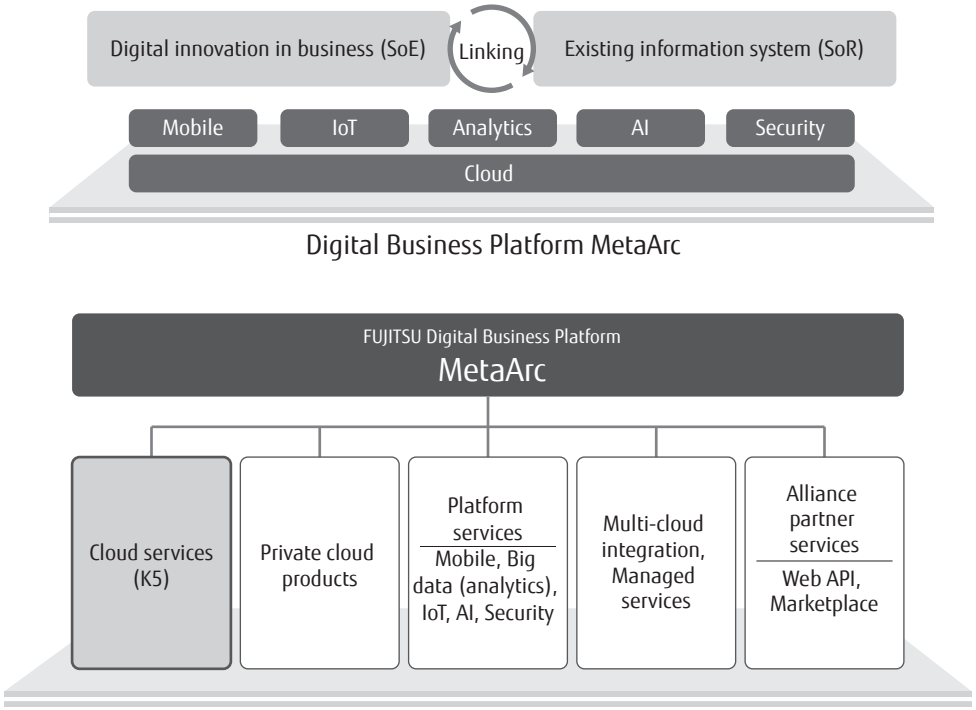

Figure 2
MetaArc configuration.

MetaArc and FUJITSU Knowledge Integration will help Fujitsu customers create new business ventures and expand their existing businesses.

4. Cloud platform K5 configuring MetaArc

In this section, we introduce FUJITSU Cloud Service K5 (hereafter, K5), Fujitsu's new cloud platform at the heart of MetaArc.

K5 is a cloud service for enterprises that integrates Fujitsu's diverse know-how with advanced open technology (**Figure 3**). It provides Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) functions for both SoR and SoE together with high-quality total support for users of mission-critical systems.

K5 has three main features as described below.

The first feature is that SoR and SoE can be seamlessly linked on the same cloud platform. K5 furnishes an application platform for deploying and operating either type of system and provides functions for handling data management and API management as needed at the time of system linking. In this way, customers using K5 can use previously prepared linking functions and common services, making it easy to perform SoR and SoE system linking.

The second feature is the adoption of open technology, which means that the latest technologies will always be used. It also means that K5 users, far from being bound to specific vendors, can collaborate and co-create with a variety of developers and service providers using standard technologies.

Finally, the third feature is that the services provided by K5 incorporate diverse knowledge in the form of industry/business know-how and system development/operation know-how accumulated by Fujitsu through many years of SI experience. In addition, the best practices developed by Fujitsu in migrating its in-house systems to K5 will continue to be applied and enhanced. Customers using K5 can expect this knowledge to support efficient development and deployment of high-quality systems.

5. Services provided by K5

As shown in **Figure 4**, K5 provides various services.

First, for IaaS, we have adopted OpenStack open source software as the cloud OS. This results in a flat & scalable architecture that can respond promptly to changes in the business environment while providing

flexible resource orchestration functions. In addition, IaaS ensures high availability and reliability through security group functions and multi-availability zones, which provide physically independent environments within a data center.

Next, PaaS can be broadly divided into three layers extending from a bottom-level domain near the infrastructure to a top-level domain near applications. Each of these layers provides one or more important services.

1) Infrastructure/Operation layer

• SF ("automatic system construction service")

This service provides a function that simplifies the packaging of system configuration information, operation definitions, and software modules and the deploying of a complete system even in a different environment. In this way, a K5 user can easily and quickly distribute and deploy infrastructure/application assets to multiple environments as needed.

2) Application-development/platform layer

• PF ("mission-critical-business platform service")

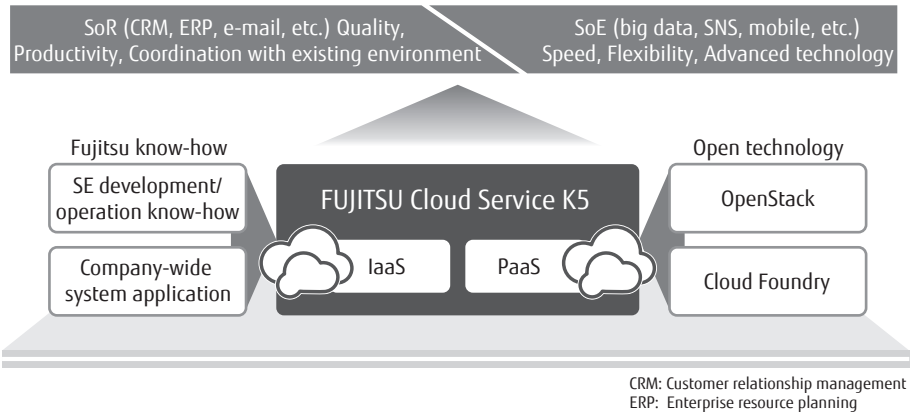

Figure 3
FUJITSU Cloud Service K5.

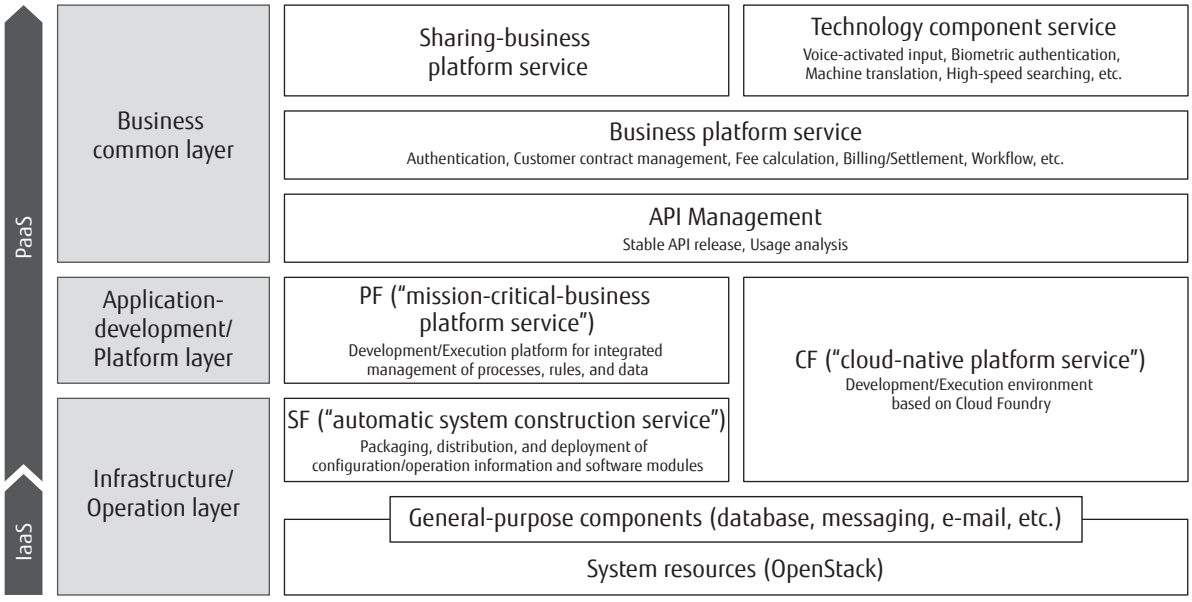

Figure 4
K5 service configuration.

This is an application platform service for SoR that is a compilation of know-how targeting mission-critical systems accumulated by Fujitsu over many years. It provides a loose-coupling function for separating data, rules, and processes from logic and a function for integrating the above on the basis of a workflow. This approach enhances flexibility in the face of business changes.

- CF ("cloud-native platform service")

This is an application platform service for SoE based on Cloud Foundry open source software. It enables a developer to select the programming language that he or she favors and to construct a cloud-native application quickly and easily through composite-type development that combines multiples services.

3) Business common layer

- "API management service"

This service makes it easy to link SoR and SoE through functions that seamlessly connect the Web APIs of each system.

- "Business platform service"

In addition to providing business middleware, this service provides industry/business-specific modular services and templates that include system engineering (SE) knowledge and know-how.

- "Technology component service"

This service provides advanced technology components such as voice-activated input, biometric authentication, and machine translation.

- "Sharing-business platform service"

This service provides basic functions for dealing with new business models such as matching and sharing.

6. K5 provision format and related services

This section describes the format of the platform environment provided by K5 and related services.

1) Hybrid cloud environment

Although K5 is a public cloud service, it can be provided in different formats depending on customer requirements for security, reliability, performance, etc. (**Figure 5**). The formats provided are a virtual-shared type corresponding to a full resource-sharing model, virtual/physical dedicated type providing a logically or physically independent server/network environment, and a cloud platform dedicated type that allocates a dedicated cloud service platform. K5 can also provide a dedicated on-premise format in which a cloud service platform is installed in the customer's data center and remotely monitored by Fujitsu.

Additionally, for customers who would like to construct private clouds in their own data centers and operate them themselves, Fujitsu provides FUJITSU Integrated System PRIMEFLEX for Cloud, a vertically integrated product for virtualization and private clouds

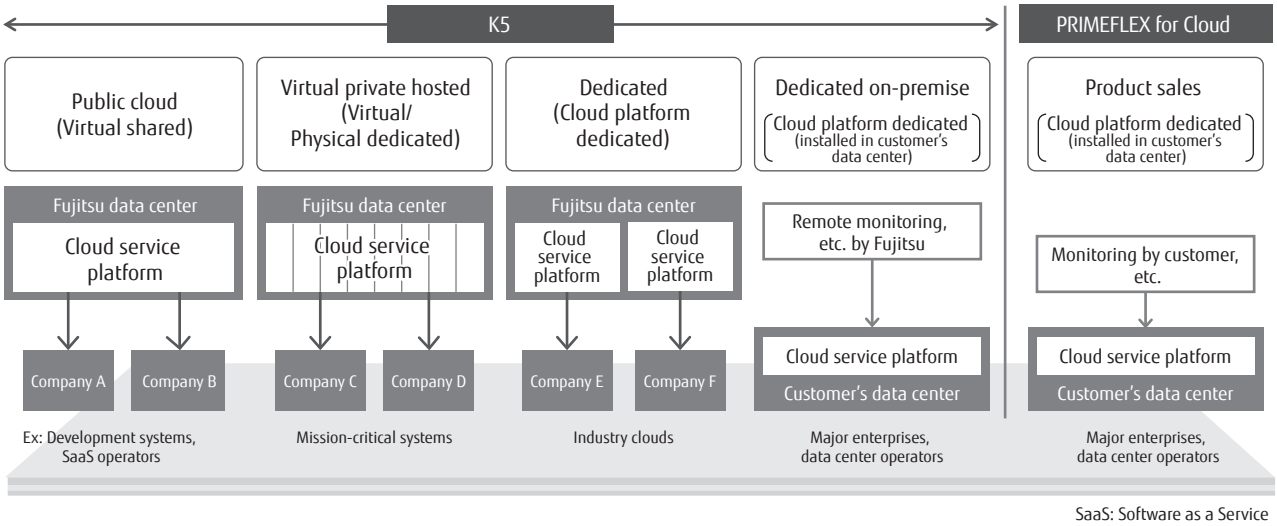

Figure 5
K5 service provision format.

using the same technology and architecture as K5. This product enables early introduction and stable operation of virtualization and private clouds while making it easy to make hybrid connections to K5.

2) Expanded PaaS services toward a digital transformation

In addition to the following services already provided by MetaArc and K5, the plan is to add a variety of PaaS services over time.

- FUJITSU Cloud Service MobileSUITE, which supports the efficient development of mobile applications and the integrated management of terminals, applications, and content toward the expanded use of smart devices in business systems.
- FUJITSU Cloud Service IoT Platform, which is dedicated to the efficient processing of large volumes of sensor data generated by people and things.
- Business Application Operational Data Management & Analytics, which can collect, process, and store large volumes of data and construct, test, and apply analytical models.
- Human Centric AI Zinrai, which provides AI functions related to perception and recognition, knowledge formation, decision support, and learning.

3) Multi-cloud integration management

FUJITSU Cloud Services Management provides horizontal and integrated management of public clouds that include cloud services of other companies and private clouds constructed in an on-premise environment managed by the customer. In this way, customers having a mixture of cloud environments can adopt an approach that strengthens their ICT governance and keeps their company-wide ICT costs at an appropriate level.

7. Maximizing value provided to customers

Fujitsu is undertaking a variety of measures to maximize the value provided to customers using the K5 cloud service.

1) Provision of reference models based on in-house practices

To put K5 into practice, Fujitsu began migrating 640 in-house systems to K5 in February 2015. It is also migrating to K5 SaaS applications already being provided to SE and product-development sites and research departments at Fujitsu Laboratories. Fujitsu seeks to enhance the appeal of K5 to customers by leveraging such in-house practices to make ongoing functional improvements and quality enhancements to K5 and to create a reference model for large-scale application of OpenStack.

2) Compilation of SI knowledge and dissemination of know-how

Fujitsu is compiling and standardizing the knowledge obtained through K5 technology testing and system application practices. It is disseminating this know-how and knowledge to SE departments to improve system application in the field and aims to promote the growth of cloud services by incorporating this knowledge into K5 functions. Fujitsu expects such refined cloud-application technologies to improve quality so that customers can use K5 at a more advanced level.

3) Global rollout of uniform platform

Fujitsu has designated the combination of MetaArc and K5 as a company-wide standard platform and plans to roll it out successively to its operations in Europe, Asia, the U.S., and Oceania, with Japan as the base. Providing a globally uniform platform in this way will enable Fujitsu to meet the cloud-related expectations of customers who are expanding their business globally.

8. Conclusion

This paper described the impact of digital transformation on the business world and introduced FUJITSU Digital Business Platform MetaArc and FUJITSU Cloud Service K5, which Fujitsu developed to deal with this impact.

The idea of a cloud-first policy, which gives priority to the introduction of cloud services at the time of system design or migration, has come to be widely accepted in the business world. As a result, there have been an increasing number of cases in which clouds are deployed on an individual basis when upgrading an existing system or introducing cloud computing for the first time in a business department. Such ICT introduction based on partial optimization tends to create an overabundance of systems that can eventually fall into an unmanageable state. At Fujitsu, we have been working with our customers for many years on

optimizing (modernizing) the silo-type systems that proliferated during the open system era. MetaArc and K5 incorporate the idea of total optimization and serve as a reliable means of modernization. We are proud of the way in which our customers entrust us with their system assets on this advanced platform.

In today's business environment, in which digital transformation is rapidly progressing, Fujitsu seeks to use MetaArc and K5 as a basis for creating a co-creation environment with society and companies and even between companies and to contribute to the maximization of value for its customers in a borderless world.

Fujitsu is confident that building co-creative relationships with its customers will lead to a shared sense of growth and development as genuine partners.

References

1) Driving business by digital technologies = Knowledge integration for big change. IT leaders special edition, Impress (2015) (in Japanese).

Noriyuki Nakamura
Fujitsu Ltd.
Mr. Nakamura is currently engaged in the global sharing and application of systems integration knowledge and associated technical support.