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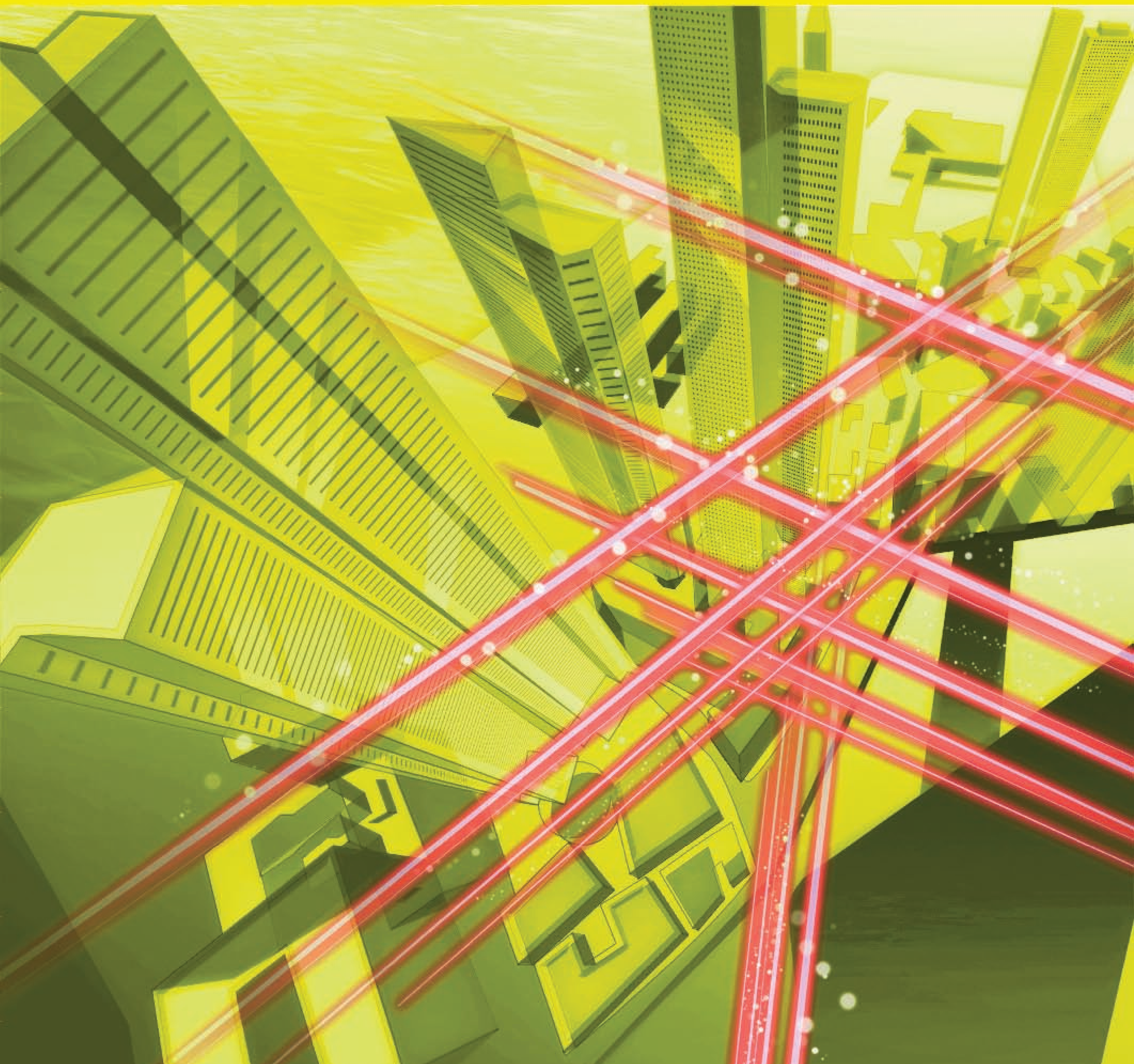

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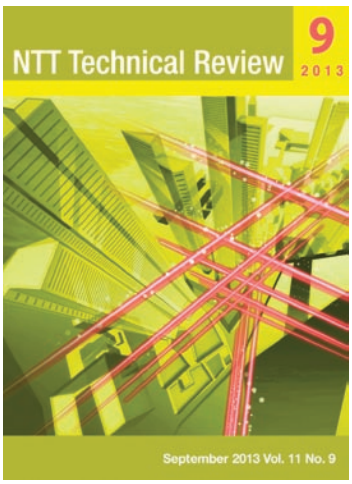


Setting Numerical Targets Provides a Foundation for Fostering Talent and Providing Our Clients with High Quality Services

John McCain,
Chief Executive Officer, NTT DATA, Inc.

Overview

NTT DATA, Inc., founded in 2012, under the Global One NTT DATA system, provides a wide range of IT services focused on the North American market from its base in the United States. Its business endeavors include application development and support, business-process outsourcing, cloud services and staffing for a broad set of industries including financial services and insurance, manufacturing, life sciences and healthcare, and the public sector including federal, state, and local governments. We asked CEO John McCain to tell us about the objectives he has set for the company during his tenure, his specific strategies to generate profits and invest in human resources, and his core beliefs as head of NTT DATA, Inc.

Working toward greater brand recognition and revenue growth

—Mr. McCain, can you tell us about your management strategies and objectives as CEO?

Our business objective is to achieve profitable revenue growth. At present, our annual revenue in North America is about $1.4 billion dollars, but our long-term aspiration for NTT DATA [1] in this market is to be a top 10 provider with revenue closer to $5 billion dollars.

To support our business, we employ about 18,000 professionals, 10,000 of whom live in India and work on our global delivery team. The other 8,000 reside in the United States and Canada.

Globally, I believe that NTT DATA can provide a level of quality, innovation, and customer service that no other information technology (IT) service provider can match. While we have a very nice presence in the U.S., the NTT DATA brand is still relatively unknown.

So we are cooperating closely with our corporate headquarters and the marketing group in particular to implement programs that strengthen the NTT DATA brand in the marketplace.

The U.S. economy is coming back, and I would like NTT DATA to grow with it and to be stronger than our competitors.

Based on present conditions, and in line with NTT DATA's Medium-Term Management Plan, our objective is to achieve revenue growth of 10% over the next few years. This steady growth and continued targeted acquisitions will help us meet our objective to become one of the top five global IT service providers.

Investing in the global market requires awareness, resolution, and preparation centered-around "trust"

—How would your expansion strategies differ between the U.S. and global markets?

I would say that they differ in terms of portfolio focus. Strategy must depend on the characteristics, needs, and target industries of the continent or region in question. The technologies and skill sets that we can provide will also differ from region to region. In Japan, for example, there is a higher demand for traditional outsourcing, that is, for the on-shore, in-country provision of services in combination with longer-term, larger-scale contracts.

In the United States where delivery of technologies and services from off-shore, overseas sources is common, our contracts are often more tightly scoped, short to medium term projects—more like a managed services model.

The fact that NTT DATA can adeptly deliver both of these models gives us the best of both worlds that independent companies cannot produce simply through collaboration.

In this regard, Keane, the company that I used to belong to, entered the global market by forming partnerships, but it never achieved a scale of the likes of NTT DATA. Becoming a member of the NTT DATA Group has enabled us to participate in the global market as a member of the 6th largest IT company in the world.

This association enhances our level of credibility with our customers, and we feel that having access to NTT DATA and NTT Group services is a very valuable asset. As we collaborate more, we will be able to provide a wealth of services that would not be possible as a single company.

—There are many outstanding IT companies in the world. Why did you choose the NTT DATA Group?

Yes, we had choices! But, several years ago, we started a "courtship" with NTT and got to know each other along the way. And the more we learned about each other's culture and values, the more we thought about working together. I would sum up our common culture in one word: "trust." Building a relationship in which each company brings its individual strengths to the table is important because that process can empower each other. So when the NTT DATA Group presented an offer to acquire Keane, it was very natural for us to proceed with talks toward becoming a member of the group.

We also felt that what we could contribute to NTT DATA would be very valuable. Keane maintained a very big customer base in the United States as well as an excellent off-shore delivery capability, which we felt would fit well with NTT DATA's efforts in rounding out its global portfolio.

I don't think it's possible to build a trustworthy relationship with just any company. NTT DATA is a very mature company having been a global business for some time. They are resolute and prepared to invest in the global market, and I believe this strong desire to expand is important as it relates to all types of business development.

Healthy competition within the company raises client satisfaction

—In light of the above, let me ask you again: What do you think is NTT DATA, Inc.'s most important core value?

As a company, I believe leadership is of primary importance. With good leadership, the business can become stronger and even better services can be provided.

NTT DATA, Inc. is a high-energy and "fun" company to work at, with employees who are driven and results-focused. Additionally, as senior leaders driving from the top, we employ a model featuring a certain amount of transparency and a fair bit of competitiveness to get the best performance out of everyone.

For example, we hold a senior-leader telephone conference monthly with the top 150 leaders of the company to review monthly results. Here, we have a scorecard that ranks each unit with the manager's name from best to worst in terms of revenue growth and profit performance. The results of this scorecard are presented for everyone to see. By comparing everyone's results in this way, each leader can learn where he or she stands in comparison with his or her colleagues and can learn the methods and tactics of those achieving superior results. This approach invokes a competitive in-house spirit; it can motivate people to do well and produce good results for their team and the company.

Employees who produce good results can, of course, be well remunerated, but they can also experience personal satisfaction when their efforts pay off. This healthy competition can motivate individuals to improve their performance; if they are currently ranked at the bottom, it can drive them to work hard on a daily basis to improve their business unit.

In the end, I believe this competitive spirit is directly related to improving client satisfaction.

—What is most important to you in your role as CEO?

Well, it's difficult to narrow that down to one thing, but I think that I'm very focused on determining how to get each team to best deliver its financial commitments to the company. "Making our numbers" is the foundation for doing all the other things that we need to do. If we deliver on our commitments, we can invest in our people and in new products and services. It gives the company vitality to do what it needs to do in terms of projects, products, and reengineering.

As CEO, it's important that I make sure that we have the right leaders in charge of the right businesses, and that I strive to develop and grow them. I am always focused on developing talent and on providing effective human-resource programs. And this is not limited to individuals—I look to develop the abilities of entire teams as well. The ranking system using scorecards that I mentioned earlier is one example of how I approach talent management.

In addition, I have made wonderful friends and have had fabulous mentors throughout the course of my long career, and through them, I have learned the value of trust and respect in business. In particular, Mani Subramanian, the former chairman of Keane International, Inc. was a man of great virtue and courage who was willing to take risks. I learned much through my interaction with him.

Striking a healthy balance between your business persona and private life

—Mr. McCain, can you leave us with a message for all NTT DATA, Inc. employees?

Of course. Let me first touch upon my style of time management as a business person. Time is very precious to me, and in the end, it's all about efficiency. That's the way it has always been for me. I am very diligent with starting and stopping the day on time, and avoiding long, drawn out meetings. I think it's really important to protect the quality of life, so I manage my calendar very well.

I don't think life is only about work. Of course, there are times when you are swamped with work, but as a business person, I think it's important that you maintain a healthy work/life balance. The life of your spouse and children are also important as you move through life. I like to work hard and fast while I'm at work but I also like to relax away from work. It's important to be able to take time off, to turn your business life on and off.

It's a very exciting time for all of us. We are all blessed with astonishingly talented colleagues and leaders and superior clients. We must not forget that we are the "face" of NTT DATA. We must always have our customers' success in mind and perform high-quality work as a united team. Our opportunities are limitless!

Reference

[1] T. Iwamoto, "Achieving Dramatic Gains in Domestic and International Markets through Remarketing," Vol. 10, No. 11, 2012. https://www.ntt-review.jp/archive/ntttechnical.php?contents=ntr201211tp1.html

Interviewee profile

■ Career highlights

John McCain joined Electronic Data Systems in 1986, rising up to Executive Officer and Senior Vice President. He then served as CEO of Capgemini North America from 2003, Senior Vice President and General Manager at Hewlett-Packard from 2006, and President and CEO of Keane from 2009. He took up his present positions as an Executive Officer of NTT DATA Corporation and CEO of NTT DATA, Inc. (North America) in 2012.

Service Visualization to Achieve Faster Service Creation

Naoki Uchida

Abstract

As part of efforts to improve our research and development (R&D) activities, we need to speed up our service-related R&D. These Feature Articles introduce various approaches for this, from visualizing services to conducting trials on XFARM (R&D cloud environment) that NTT Service Evolution Laboratories is working on.

1. Introduction

The gap that exists between research laboratories and business operations has long been known as the *valley of death*. This valley represents the many obstacles that must be overcome before research achievements can be commercialized. These obstacles include cost considerations, product development, and market expansion hurdles. Research achievements that fail to make it through this valley fall into disuse and oblivion.

With regard to services, as opposed to component technologies and network node technologies, there are thought to be two such valleys (**Fig. 1**). The first valley relates to how technologies can be combined into useful services. Even a good technology will fail to make it into the world unless it can be incorporated into services that appeal to users. The second valley relates to whether services created in this way can actually flourish. This consists of hurdles from a business viewpoint such as demand, market scale, pricing, and the costs of systems and their operation.

NTT's laboratories have made advances in technologies that are associated with many services, for example, voice recognition, video codecs, language processing, audio technology, recommendation systems, and life logging. However, we have tended to concentrate our efforts on the research and development (R&D) of individual technologies, and no department has had overall control of service proposals.

Therefore, in line with recent trends towards

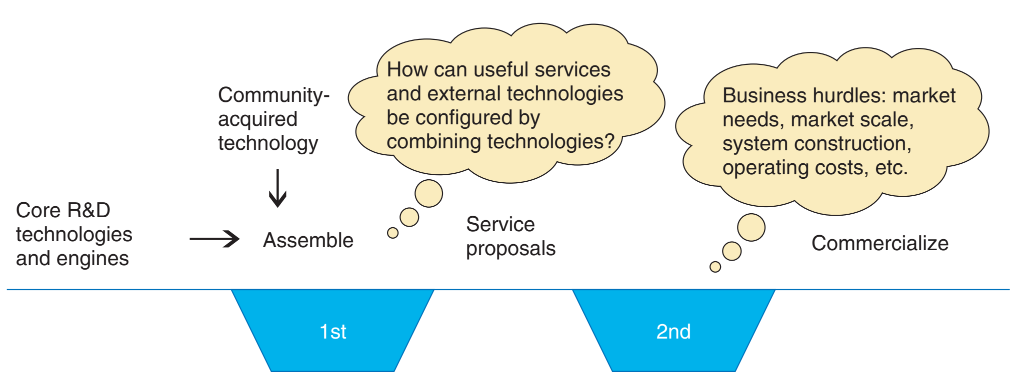


Fig. 1. The two *valleys of death* in services.

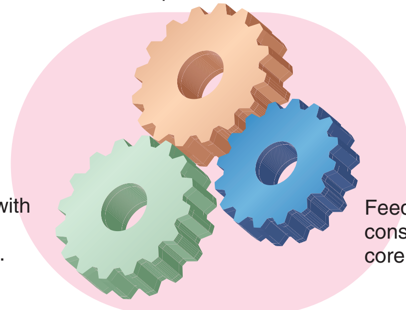


Fig. 2. Service-related R&D efforts.

strengthening service systems, we have held discussions on how the R&D of services should be promoted. The keywords that cropped up in these discussions are *service visualization* and *open innovation*, which are intended to produce feedback on the development of core technologies (**Fig. 2**).

Service visualization is an activity to develop service prototypes that incorporates R&D technologies based on certain concepts. Although research achievements have been widely exhibited in the past, service visualization represents a transition towards presenting the feasibility of new technologies in the form of services, instead of simply demonstrating these technologies in isolation.

Open innovation is an activity that builds services by actively incorporating technologies from a wide range of external sources such as other research organizations and commercial products. One aspect of services is that they are assembled from multiple technologies. This assembly can be difficult to achieve only by using technologies developed in a laboratory, so the scope of proposals includes not only a pick and mix range of services based on individual technologies, but also a menu of services with added value that provide a balanced combination of multiple ingredients (technologies).

Feedback on the development of core technologies is provided with the aim of giving the technical R&D departments prompt feedback on external opinions and the findings of service visualization and open innovation efforts.

The three initiatives mentioned above should make it possible for services to traverse the first of the *valleys of death* mentioned at the beginning of the article.

In line with the objectives discussed above, a *Service Incubation Project* (*SIPT*) has been promoted since August 2011 with the aim of advocating the integrated management of service-related R&D projects, as shown in Fig. 2, chiefly within the NTT Service Innovation Laboratory Group. A task force whose remit includes this service visualization was set up and put into operation at NTT Service Evolution Laboratories.

2. Service visualization

As mentioned above, since services have an *assembled* aspect whereby they can deliver the collective strengths of multiple technologies, they cannot be implemented if they are created exclusively from technologies developed in a laboratory with a *not invented here* attitude. The concept of service visualization by analogy with the development of an automobile through the production of prototype vehicles is shown in **Fig. 3**.

The basic idea is that it is possible to develop a versatile range of cars that use the same engine. Even if the cars use engines produced by another company, the aim is to produce prototype cars with a high degree of utility that people will want to own. In addition, there are also the following separate policies:

(a) Develop cars with character (inspired by usability, consistent service concepts).
(b) Acquire a good engine and carefully selected parts (open innovation incorporating new technologies and understanding existing technologies).
(c) Regard the chassis as a network (geared towards carrier services).
(d) Consider whether other vehicles could be made by using the same method (architecture/

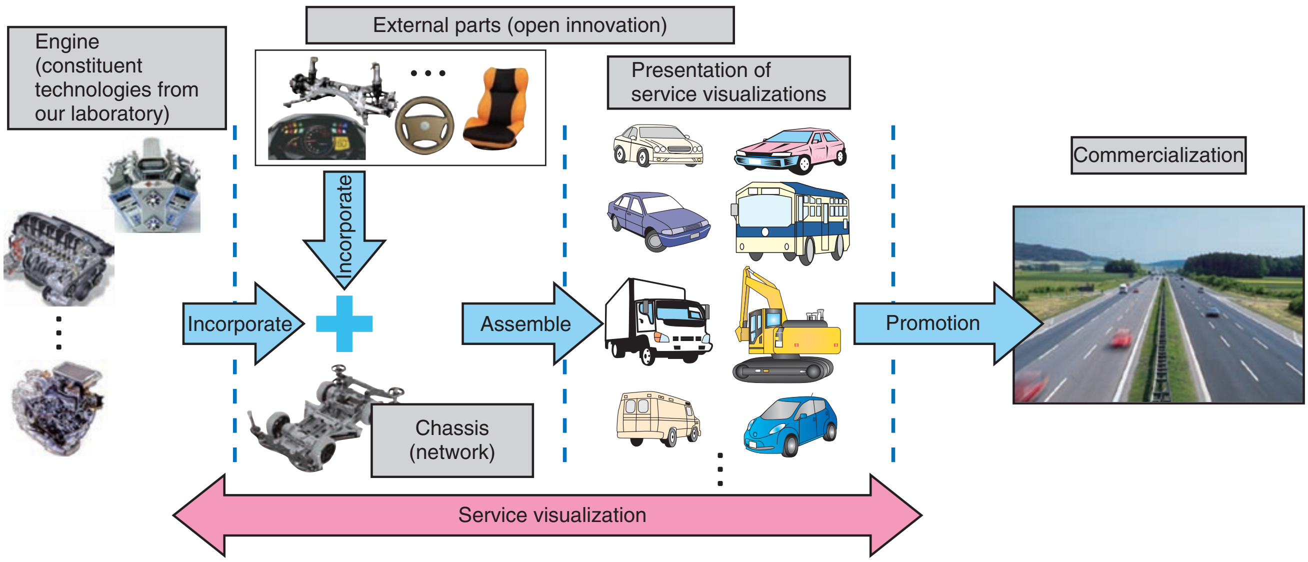


Fig. 3. The concept of service visualization.

platform-oriented).

(e) Build lots of prototype cars (and carry a percentage of these through to actual production).

If service visualization is carried out by recklessly introducing services and applied technologies, it will not conform to the above policies. We have therefore established the following framework for proceeding with service visualization.

(1) Portfolio of work fields

The users targeted by services cover a diverse range and include home and business users. There is also a certain degree of directionality in the key technologies applied to these services. A general representation of the types of services applied in different fields is shown in a portfolio of work fields (**Fig. 4**). The directionality of each field is established by representing business fields along the horizontal axis and technologies on the vertical axis. In this way, we can clarify the service visualization target and check the adequacy of all areas. This portfolio is subject to review at suitable intervals, especially with regard to the technical fields.

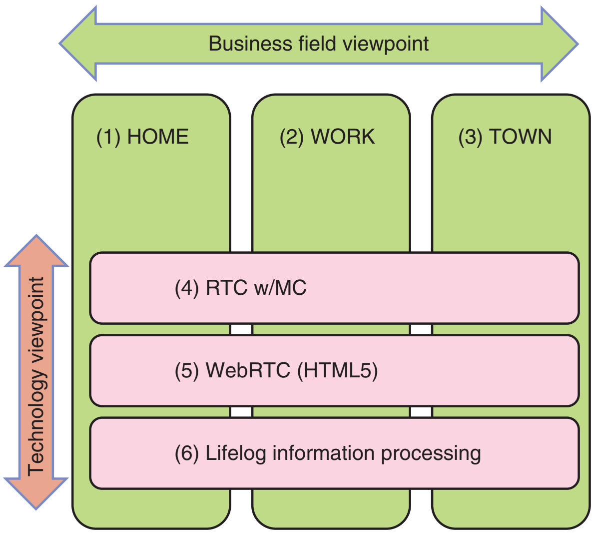
(2) Service model

Service ideas are created through brainstorming with the assumption of certain use cases in order to come up with general-purpose services that can be applied to multiple use cases. For example, if we assume that we are working on a speech-to-text conversion service for real-time communication (RTC) [1], then we can consider augmenting or modifying this service to make it useful for other forms of RTC media. In other words, as a higher-level concept of a service under consideration, we can envisage a set of services that augment and modify media in RTC. This is just like the class-instance relationship in the object-oriented programming paradigm, so in this model they are respectively called service classes and service instances. Service visualization takes place at the service instance level, and discussions of architecture take place at the service class level; this resembles the characteristics and processing patterns of service processing. In this way, we can go about system visualization in a systematic way (**Fig. 5**).

(3) The purpose of service visualization

When service visualization from the research laboratory side was shown to people on the business side, it received comments such as “Interesting, but it doesn’t solve the issues we are currently facing”.

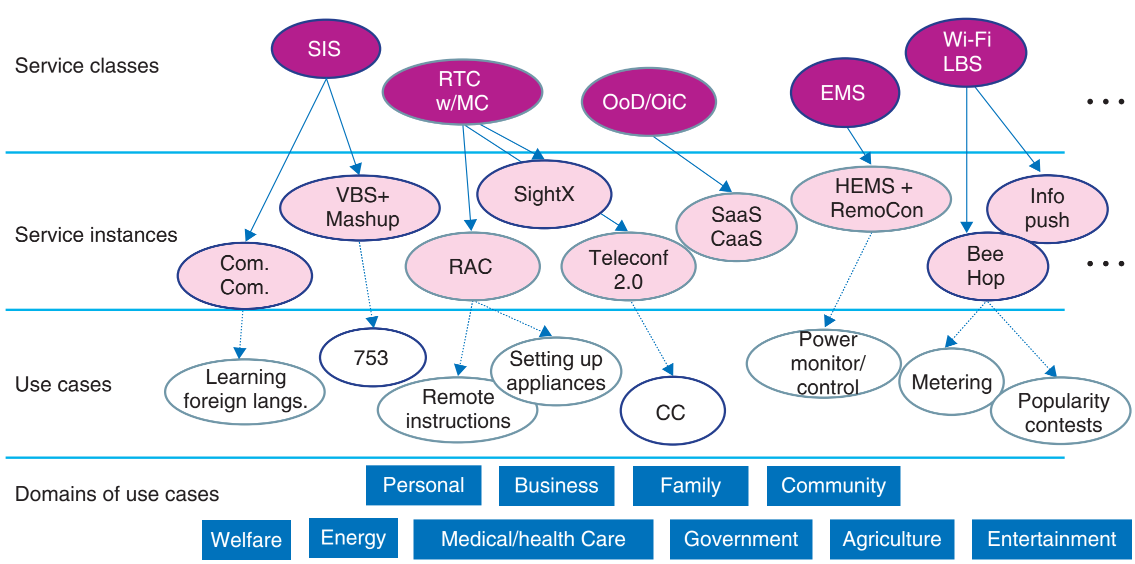
Therefore, we decided to classify the visualization of services in terms of their main purpose. If we take as a starting point the business-side issue of visualizing a service that is on the verge of being practically implemented and that can be implemented using current technology as proposed by the research laboratory, we perform a *near-business type* service visualization based on the solution proposed by the research laboratories. A *service vision type*



Criterion	Description
(1) HOME	- A group of services that follow on from home ICT and IPTV to make the home "smarter" and more comfortable
(2) WORK	- A set of new office communication services - The embodiment of a vision beyond simple cloud migration
(3) TOWN	- A group of area-based services that provide a rich urban information environment based on the spread of Wi-Fi and smartphones
(4) RTC w/MC	- An integrated group of services combining smartphones, cloud technology, and networks by exploiting the strengths of media processing in RTC, which is the core of carrier communication services
(5) WebRTC	- Gaining an understanding of, and dealing with, WebRTC technology that will erode call revenues - A group of services that use this technology to counter OTT services
(6) Lifelog information processing	- A group of services that apply lifelog information available to carriers. Also associated with big data. Addressing issues such as data collection costs and privacy concerns

HTML5: hypertext markup language, version 5
IPTV: Internet protocol television
ITC: information and communications technology
MC: media conversion
OTT: over the top

Fig. 4. Portfolio of fields of work.



CaaS: communications as a service
CC: closed captioning
EMS: energy management system
HEMS: home energy management system
LBS: location based service
OiC: office in the cloud
OoD: office on demand
RAC: remote assistance communication
SaaS: software as a service
SIS: smart information sharing service
VBS: virtual bookshelf

Fig. 5. Service model.

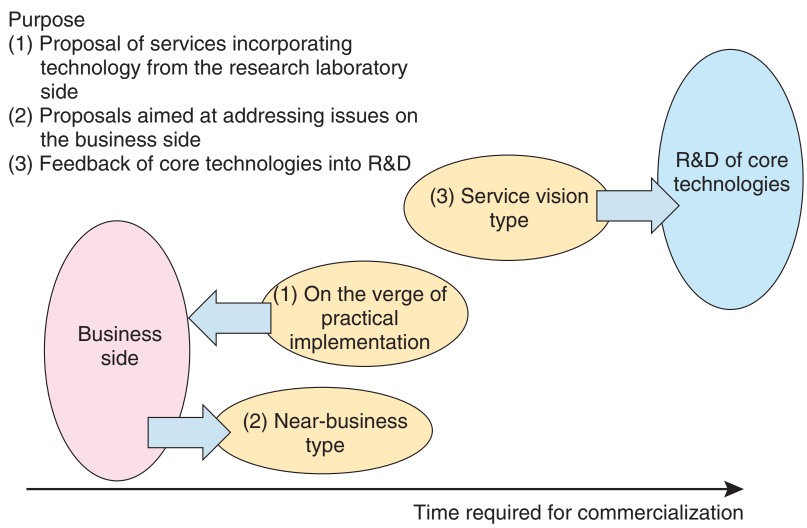


Fig. 6. Purposes of service visualization.

visualization is also performed in order to visualize the image of a service that is difficult to perform at the current level of technology, and to facilitate discussions on the directionality of the R&D of core technologies (**Fig. 6**).

We developed a specific system for service visualization by setting up an in-house production unit for service visualization in the research laboratories. We started this system with the target of carrying out at least one service visualization per month. Some work has been done that facilitates this process. For example, a library of systems and previously visualized service functions has been created. As a result, we can now achieve a speed of one service visualization every one or two weeks. At the NTT R&D forum and other events that followed the launch of this system, we gave at least five demonstrations of service visualization on each occasion.

In this feature article, we introduce the main service visualizations that we have so far performed, except for visualizations such as *near-business type* services and services that are currently undergoing trials, which we are unable to disclose.

3. XFARM

Recently, the concept of *lean start-up*[*1] has gained recognition. Since service visualization is only used for prototypes, these prototypes cannot actually be used by their intended users even if they include the service images or technical proposals.

After service incubation measures have been taken with the aim of speeding up service-related R&D, a service still has to negotiate the *sea of Darwin*[*2], where it is subject to a form of natural selection before it can really be accepted by users.

Therefore, the next issue to be tackled after service visualization is the construction of a cloud-based service trial farm environment for operational research at the NTT Software Innovation Center, where services of sufficient quality for end-user interaction can be uploaded and tried out [2]. We call this environment “XFARM” (**Fig. 7**).

The XFARM environment has the following two purposes:

(a) By implementing services on the cloud from where they can be delivered via networks, we aim to speed up the provision and launch of trial services. This provides a source of feedback on the proposed services and constituent technologies.

(b) By setting up various engines and component groups in the cloud and sharing them between multiple visualization projects, we aim to achieve visualizations more quickly and at lower cost.

*1 Lean start-up: A way of examining responses to customer needs by creating the minimum quantity of products, services, and prototypes with little expenditure

*2 Sea of Darwin: A hurdle that must be cleared in the process of commercializing a developed product

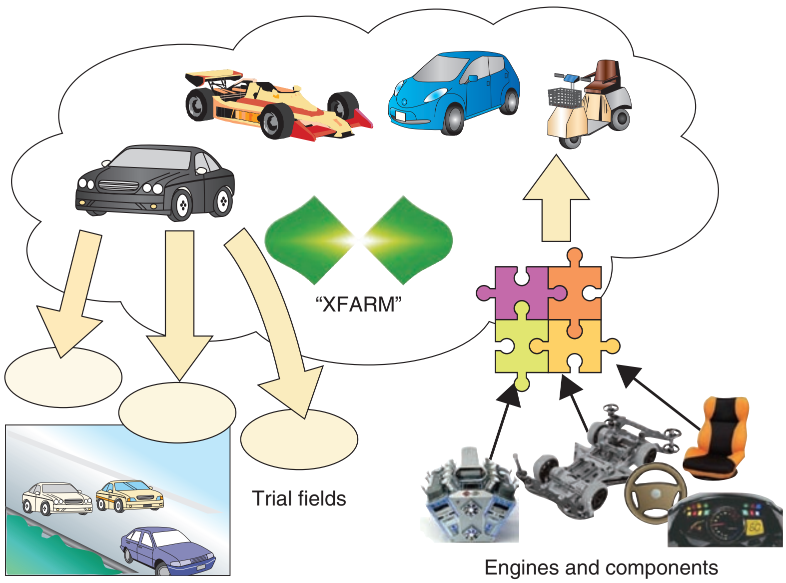


Fig. 7. XFARM service visualization.

4. Future prospects

About a year and a half has passed since we started the initiatives discussed in this article. In the future, we will continue to strengthen the activities discussed here throughout the R&D of services while collaborating with the various departments of related businesses and producers.

Furthermore, in terms of how to go about researching and developing services in the era of Next Value Partner (NTT slogan) and clients, we will focus on taking quick action that is responsive to changes in the outside environment.

References

[1] K. Shimizu, M. Suzuki, S. Nishinaga, and S. Muto, "Office in the Cloud: Providing Office ICT Environments through a Single Web Browser," NTT Technical Review, Vol. 11, No. 9, 2013. https://www.ntt-review.jp/archive/ntttechnical.php?contents=ntr201309fa3.html

[2] K. Onishi, Y. Tomita, H. Tate, M. Urata, N. Uchida, H. Masuda, T. Kono, and T. Komiya, "The XFARM Platform for Faster Service Creation," NTT Technical Review, Vol. 11, No. 9, 2013. https://www.ntt-review.jp/archive/ntttechnical.php?contents=ntr201309fa6.html

Naoki Uchida

Senior Manager, Planning Department, NTT Service Innovation Laboratory Group.

He received the M.S. degree in electro-communication from the University of Electro-communication, Tokyo, and the Dr.Eng. degree in network service systems from Waseda University, Tokyo, in 1983 and 1985, respectively. Since joining NTT in 1985, he has been active in R&D of network service architecture, intelligent networks, Next-Generation Networks and service delivery platforms. From 1999 to 2003, he was responsible for the development of commercial network services at NTT EAST. He is now leading the Strategy Project Team for Services and Technologies in NTT R&D, and working on new innovative services for fixed and mobile converged networks and service delivery platform architecture.

Wi-Fi LBS: Information Delivery Services Using Wi-Fi Access Point Location

Manabu Okamoto, Naoki Fujita, Goro Inomae, and Hiroyuki Tate

Abstract

Wi-Fi location-based services (LBS) enable location-based information delivery and user monitoring for smartphone users by using Wi-Fi access point positioning data to reconfigure terminal and sensor data stored in the cloud. This article reports on Wi-Fi LBS, which includes functions for service visualization, automatic (push-type) delivery of travel information, and communication for assumed application to tourist information services.

1. Introduction

The widespread use of cell phones has enabled users to easily access content through a network while moving around outdoors. The explosive growth in the popularity of smartphones has led to a greater variety of services being implemented using the Internet and has led to proposals for various kinds of network services for users when they are outdoors.

Many Internet services have been proposed that guide users to shops, tourist sites, or other places in the real world around them as the users move about. Such services belong to a new class of services called online to offline (O2O) services. We can imagine, for example, a service in which a customer can access the network inside a shop in order to obtain coupons for that shop or to use other such functions while shopping.

Many services that send data to cell phones or smartphones to provide location-based information for tourism or information on traffic conditions have also been implemented. QR (quick response) codes that provide links to web services have been posted in places such as bus stops and on tourist information signs, and contactless integrated circuit (IC) card readers have been installed outdoors for operation by cell phones.

Other common services introduced recently involve attaching smartphone positioning data to photos when uploading them from smartphones to sites such as social networking services (SNSs) so the user's location can be displayed on a map provided by a map service on the SNS.

When we use smartphones and other such terminals outdoors, we can also use a number of new services that are available that involve delivery of information that corresponds to the smartphone location and monitoring of the location.

We have used the Wi-Fi function of smartphones to visualize information services that are based on the place in which the smartphone is located. We exhibited a class of services that we call Wi-Fi location-based services (Wi-Fi LBS) as well as one case of using visualization at NTT R&D (Research and Development) Forum 2013 as an "Information Delivery System Using Wi-Fi AP (access point) Location" [1].

This article describes the purpose of the visualization function and its configuration.

2. Visualization

We applied the Wi-Fi LBS to an example service that provides information on tourist attractions that

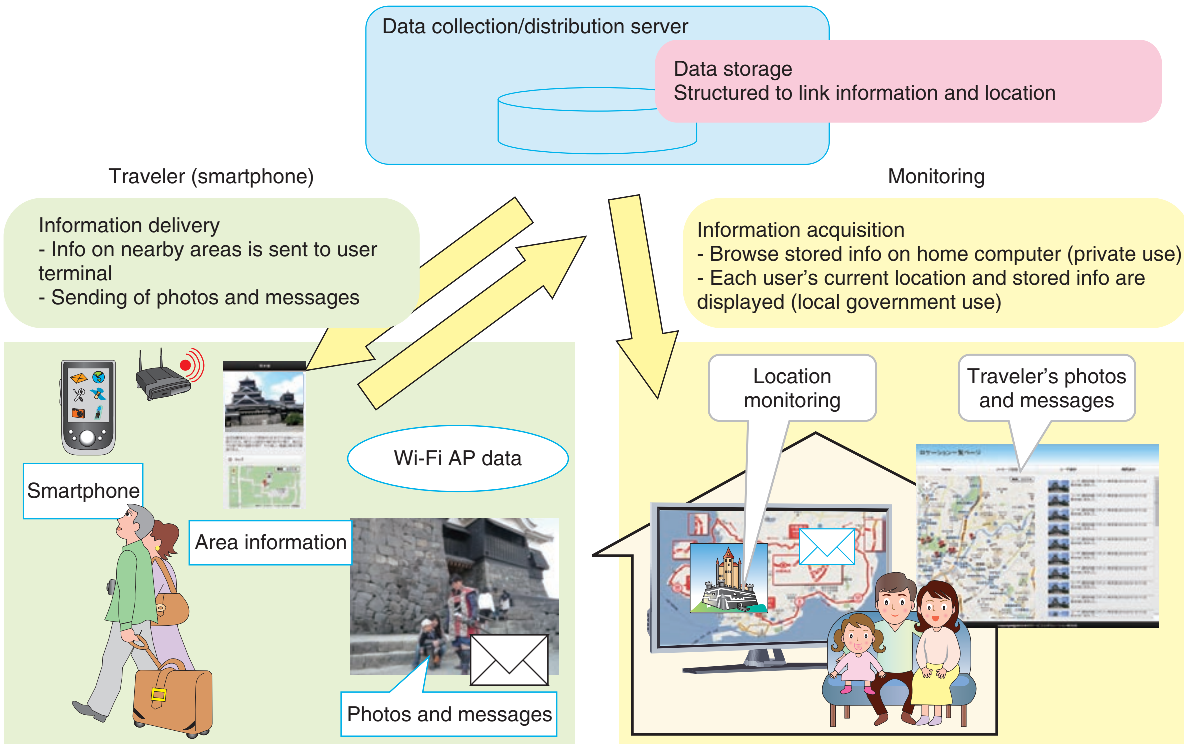


Fig. 1. Visualization service.

are near the traveler's current location. The service also has functions for monitoring the traveler's movements and communication between users, so we carried out visualization for those three services.

To implement the visualization, we installed a special application (app) in the traveler's smartphone and made sure it was running in advance. The main flow of the service is illustrated in **Fig. 1**.

(1) Information is sent, or pushed, to the smartphone of a user who is in the vicinity of a tourist attraction, and the user is notified by a message displayed on the smartphone screen.
(2) The user taps the screen to see the information.
(3) The service monitors the location of the user to allow monitoring on the web from different locations. Messages can also be sent via the service to the user's smartphone.
(4) The smartphone user can upload memos and photos taken with the smartphone from the screen on which the tourist information is displayed. The uploaded data can be displayed on a map accessed by the server from the web.

The monitoring function described in items (3) and (4) above enables family members at home, interested persons, and service subscribers to monitor the user's activities. It also allows communication with the traveler. Our premise is that service scenarios that involve using the communication and monitoring functions in addition to the information delivery function in this way offer advantages to the smartphone user, family members, and service providers.

3. Objectives of visualization

The three functions of information delivery, monitoring, and communication can be used individually or in any combination. Examples include O2O services for notifying smartphone users about nearby shops or for delivering content related to displays in museums, art galleries, etc. Services that determine the location of smartphone users can also be implemented. Wi-Fi LBS is premised on the delivery of local information to tourists as an example service that effectively uses the three functions described above.

Wi-Fi LBS also uses the smartphone's Wi-Fi function to coordinate services with the user's location. We deliberately chose not to use contactless IC card recognition, which requires user action, so that users could receive the provided information without any conscious operation simply by going to a place. Furthermore, because problems can occur when using a global positioning system (GPS) indoors and because visualization simply needs to detect whether or not the user is at a location where the service can be provided and does not require accurate coordinates, we chose to use Wi-Fi access points placed in locations where the service can be provided instead of using GPS. The smartphone detects the access point and connects the user to the service.

Wi-Fi access is now a feature of tablet devices as well as smartphones, so we expect that the use of Wi-Fi will enable the provision of services to many portable terminals.

4. Wi-Fi LBS functional configuration

The visualization function includes functions for (1) detecting the location of the smartphone, (2) delivering content to the smartphone, (3) monitoring the smartphone (terminal), and (4) communication. Detection of the location is the basis for the other functions, which provide services to the user. Each function is explained below.

4.1 Location detection

The function for using Wi-Fi to detect locations is a key feature of our method. Currently, mainstream methods to detect the location of cell phones and smartphones use GPS to obtain device coordinates or use cloud services that provide coordinates based on information from nearby Wi-Fi access points. Our prototype service controls service functions by simply detecting when the device is near a Wi-Fi access point that is registered in a service rather than obtaining smartphone location coordinates.

The detection process is performed by an app that is installed on the smartphone. The app periodically scans for Wi-Fi access points and sends data on detected access points (SSID (service set identification), MAC (media access control) address, etc.) to the service on the cloud. If the access point is registered in the service, the service returns content information (URL (uniform resource locator) etc.) to the smartphone. In this approach, the smartphone accepts delivery of information according to whether or not there is content rather than according to the location coordinates.

Because the smartphone identification (ID) is sent when the smartphone sends information on the detected access points to the cloud, the service on the cloud side can determine if the smartphone is near a registered access point.

Thus, location detection by this prototype service is simply a matter of determining whether or not the user is near a registered access point rather than dealing directly with location coordinates. It is therefore sufficient to directly associate content with the locations at which a service is to be provided, which makes it easy to set the content and also simplifies the management.

4.2 Content delivery

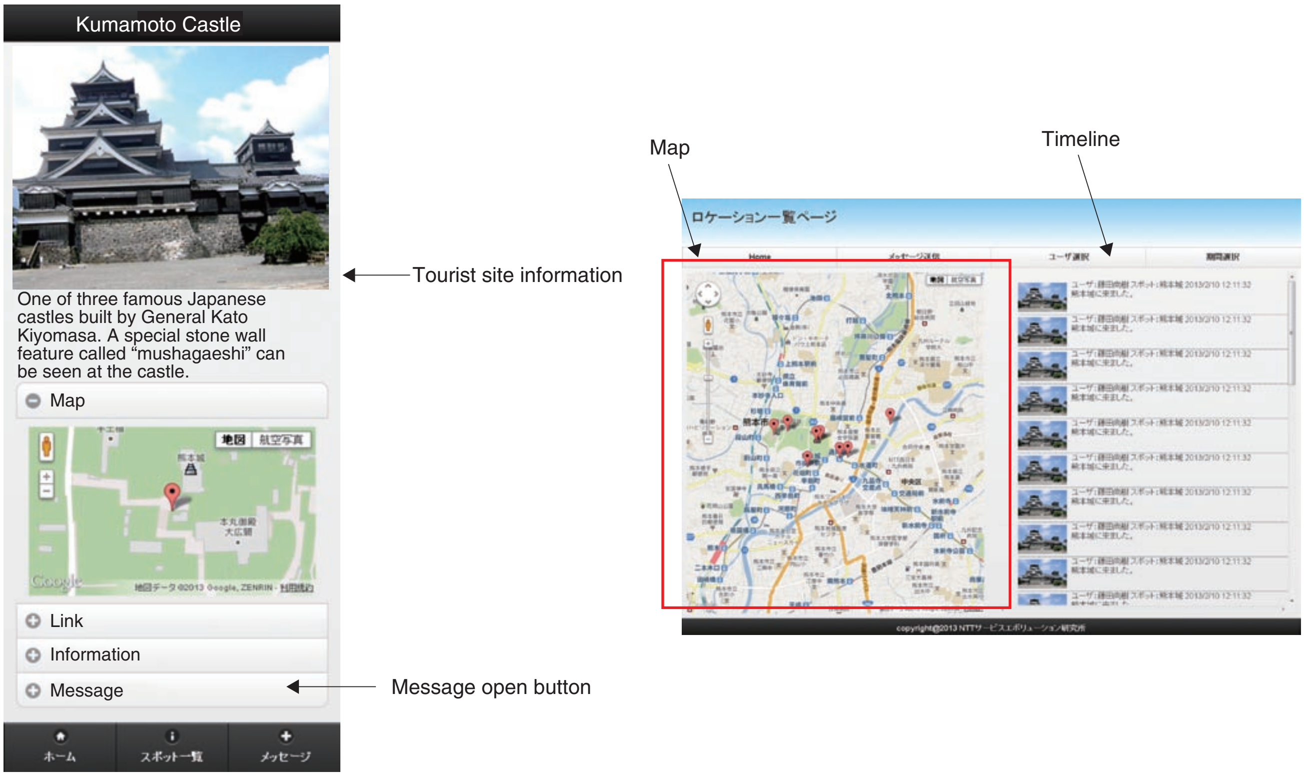
Content delivery is a basic service of this visualization for users. When the location detection function determines that the user is near a Wi-Fi access point for which there is content on the cloud, that content is delivered to the user's smartphone. Another delivery method, called quasi-push delivery, is also available. In this method, a special app installed on the smartphones automatically displays the content. The tourist guide service assumed for visualization here, however, simply displays the message "There is a tourist attraction nearby" on the special app, and when the user taps that message on the screen, a web browser is brought up that contains the URL that was sent by the service.

Because the tourist information is described in HTML (hypertext markup language) for display by the smartphone's web browser, the content is easy to produce, and links to existing web content can also be used. The visualization function creates a screen of existing links to tourist spots in combination with the output of an Internet map service (**Fig. 2(a)**). The communication function that is described later in this article can also be used directly from the tourist information screen, which makes it easy to understand how the message relates to the tourist site.

4.3 Terminal monitoring

The function for monitoring the location of the smartphone user (traveler) can be used by various people, for example, by a traveler's family members, a teacher who is leading a school trip, or other people interested in knowing where the traveler is. Another possible use is by the administrators of tourist spots who can use it to monitor the flow of visitor movements.

The smartphone IDs that are sent to the service are managed on the cloud side, so it is also possible to select particular smartphones to display information. The visualization described here is mainly assumed



(a) Smartphone screen

(b) Home computer screen

Fig. 2.   Screen images of visualization service.

to be used, for example, by the leader of a school field trip or by fellow travelers, so the locations of multiple travelers are displayed together. When the intended use is to monitor someone by family members at home, a display that is specific to a particular smartphone is probably desired.

On the monitoring side, the location of the smartphone user on a map is displayed by a web browser on the screen of a personal computer (**Fig. 2(b)**). In this case, the location of the Wi-Fi access point on the map must be registered in the cloud in advance. A timeline that indicates the user’s location (tourist site) each time location data are sent is displayed to the side of the map. As the user moves, a trail of marks remains on the map to indicate the past locations of the terminal. Clicking on a mark shows who was at that location and the time the person was there. The timeline also shows this information.

4.4 Communication

We added the communication function to facilitate communication of information concerning the trip among the travelers on a trip, and between travelers and their families at home, because content delivery is a passive function from the viewpoint of the traveler, and the monitoring function by itself does not impede the traveler’s movements. With this service (content delivery and terminal monitoring), the smartphone user must first start up the special app. To increase the user’s motivation to start up the service when they reach a destination, we decided that it was necessary to add a function that would increase the convenience to the traveler.

The communication function allows the smartphone user to attach messages and photos to the location currently displayed on their device. By touching the *Write* button on the web page displayed by the content delivery function, the user can upload a text message or photo taken with the smartphone. After uploading it, the message is displayed beside the point that marks the terminal location on the map and on the timeline (Fig. 2(b)). When messages for a point on the map are input on the monitoring side, the users that are near that point are notified that messages are available.

Displaying messages on the map in this way serves to both encourage the exchange of location-based information and provide a record of the trip that can be displayed when the trip is over.

5. Conclusion

As an example of a Wi-Fi LBS, we have described a visualization function applied to a service for the collection and delivery of information related to specific places using the Wi-Fi function that is built into smartphones.

The number of smartphone users will continue to increase, and Wi-Fi will grow as an important communication infrastructure for use outdoors as well as indoors. The visualization function that we have described is one use case of the Wi-Fi LBS class of services. For outdoor information services that use smartphones and Wi-Fi, we believe that many forms of services are possible, and that applications will expand to content delivery for ITS (intelligent transport systems) such as Wi-Fi access points set up by transportation organizations, the collection of local monitoring data with smartphones, and other services. In the future, we will continue to evaluate service visualization that offers even greater advantages and convenience to users and in which these and many other core technologies will be used.

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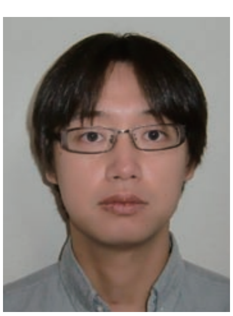

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Office in the Cloud: Providing Office ICT Environments through a Single Web Browser

Kentaro Shimizu, Masafumi Suzuki, Seiji Nishinaga, and Shinyo Muto

Abstract

The spread of cloud computing in recent years and the introduction of HTML5 (hypertext markup language version 5) and WebRTC (Web Real-Time Communication) peripheral technologies have heightened expectations for a new application platform on the World Wide Web. This article introduces Office in the Cloud as a new cloud service visualized by NTT Service Evolution Laboratories to provide diverse office information and communication technology environments on a single terminal equipped with a web browser.

1. Introduction

The widespread use of terminals such as smartphones and tablet computers that are easy to carry around and the prevalence of over-the-top (OTT)*1 real-time communication (RTC) services are providing users with new communication experiences. Within this trend, the introduction of new web technologies such as HTML5 (hypertext markup language version 5)*2 [1] and WebRTC*3 [2] means that new features are being unveiled in the RTC service environment. With conventional computer systems, users have had to install dedicated applications according to the type of terminal or operating system (OS) being used. This requirement has been a hurdle to users who wish to use RTC services. However, the new web technologies mentioned above are making it possible for users to use RTC services with only a web browser. This will make RTC services much easier to use since most terminals today provide web browsers as standard. These new technologies are also eliminating the need for application-development vendors to acquire specialized OS knowledge since knowledge of only web systems is all that is needed to create RTC applications. For these reasons, a wide variety of RTC services can be expected to be launched in the near future.

At the same time, there is concern among carriers that the above trend will have a major effect on the RTC services that they have been providing up to now. However, the lowering of the hurdle to use RTC services and the development of RTC applications provides an opportunity for carriers to open up new markets and create compelling RTC services. In line with the latter point of view, NTT Service Evolution Laboratories attaches great importance to proposing a new service concept to deal appropriately with this change in RTC services that is forecast for the future.

2. Office in the Cloud

Against this background, we propose Office in the Cloud (OiC) as a new cloud-type carrier service incorporating HTML5 and WebRTC. With respect to the service-creation portfolio described in the first of

*1 OTT: Generic name for services such as Skype and Line, a social messaging application, that are provided on top of the carrier network

*2 HTML5: Latest version of HTML, the main authoring language used to create web pages

*3 WebRTC: A standard for achieving RTC using web browsers

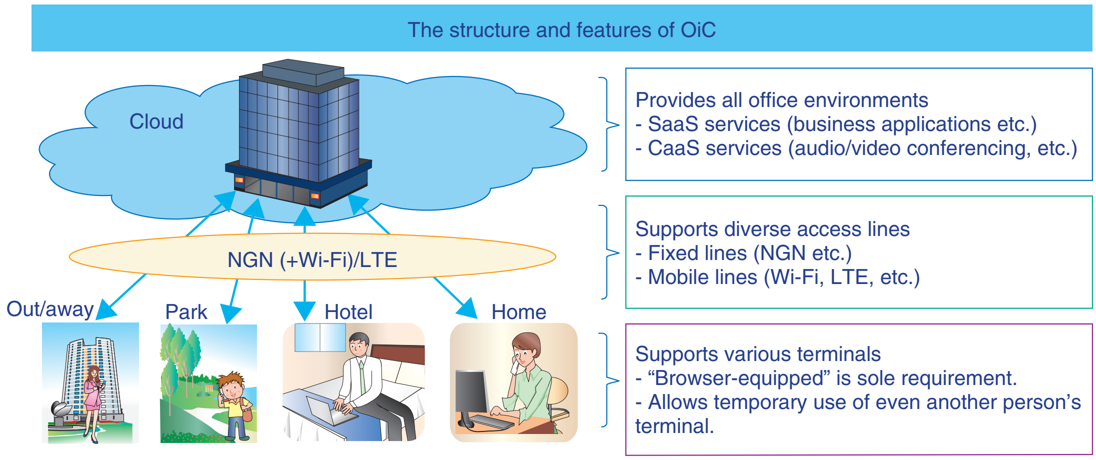

Fig. 1. OiC service concept.

these Feature Articles entitled "Service Visualization to Achieve Faster Service Creation" [3], OiC targets the field of *WORK*, and the technology that it applies is ranked as WebRTC. The following describes the features of OiC, the business domain targeted by OiC, and the OiC function configuration.

2.1 Features

OiC is a cloud-type service-provision infrastructure based on the concept of providing office information and communication technology (ICT) environments over a single web browser. The OiC service concept is shown in **Fig. 1**. It has three main features as described below.

(1) Provision of all office ICT environments

In addition to Software as a Service (SaaS) such as scheduler and mailer functions, traditional office applications, and Communication as a Service (CaaS), which is typified by audio/video conferencing and call center services, OiC can also provide SaaS + CaaS linked services. Individual SaaS and CaaS services have been provided for some time, but there have been few cases where services were provided that combined SaaS and CaaS. SaaS + CaaS linked services can therefore be considered a key feature of OiC. The OiC service can also interconnect with telephone networks that have been traditionally provided by mainstream carriers and can therefore contribute to raising the value of carrier services.

In short, OiC makes it easy to set up and provide office ICT environments by enabling all applications and telephone services used in daily business operations to be accessed through a web browser.

(2) Location-free use

The OiC service can use fixed lines, as in NGN (Next-Generation Network) as well as mobile lines, as in Wi-Fi and LTE (Long Term Evolution). Furthermore, as most mobile terminals today come equipped with a web browser as standard, OiC can be considered a location-free service that enables the user to work at any time of the day from any location as long as they have a mobile terminal and IP (Internet protocol) access.

(3) Device-free use

The OiC service can be accessed from any terminal equipped with a web browser, so it can also be considered a device-free service. OiC is of course accessible from smartphones, tablet computers, and personal computers, and we also expect it to be accessible from home electronics equipment such as smart televisions (TVs) equipped with web browsing functions. Consequently, in cases where doing work using a smartphone is difficult because of its small screen, OiC makes it possible to provide services through a nearby smart TV (such as a TV in one's hotel room) or to display service information on a large screen after user/terminal authentication is carried out.

Thanks to this feature, personal smartphones and tablet computers can be used as-is in a bring-your-own-device (BYOD) manner, which means that OiC can also minimize the initial investment on the user's side when beginning to use the service.

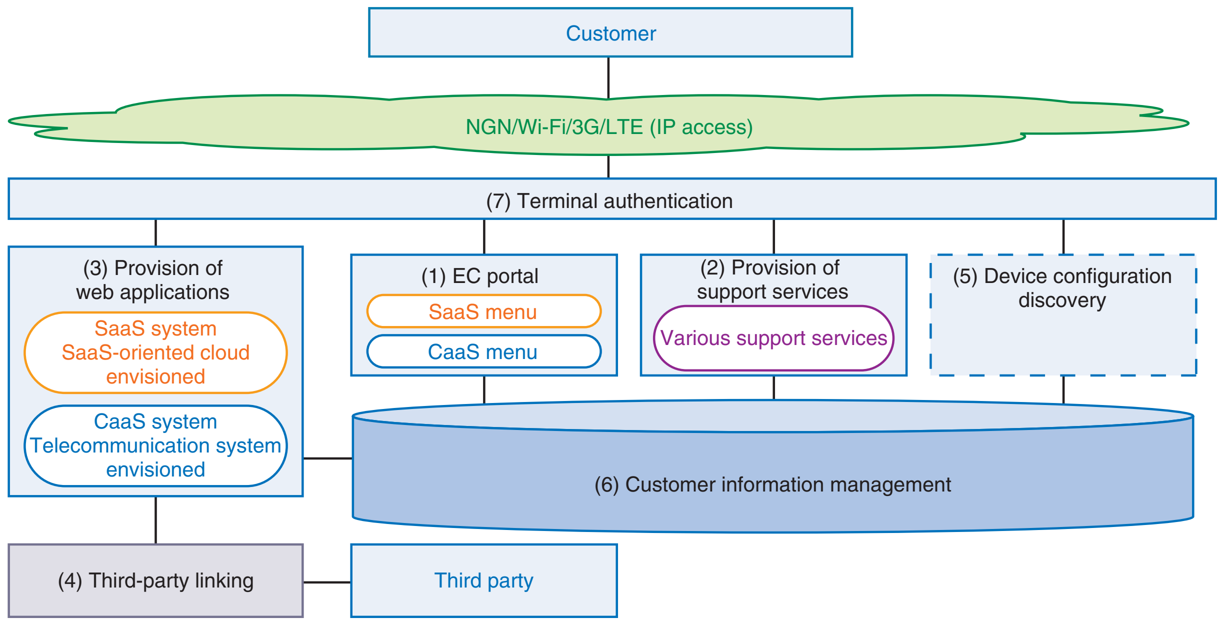

Fig. 2. Configuration of OiC functions.

2.2 Business domain

The main target of OiC is small and medium-sized businesses (SMBs). This is because while switching services in the consumer domain is simply an individual decision, switching services in the business domain requires that management make a decision from a company viewpoint. Such corporate decision-making is usually time consuming and will probably continue to be so until OTT services have sufficiently penetrated the business world. Additionally, the reason for targeting an area on the SMB scale is that companies of this size can greatly benefit from the cost-reduction effect of using cloud services compared with large corporations, which makes using OiC all the more advantageous. Furthermore, with increasing attention being paid to *digital nomads* who work without the need for a physical office, the OiC features of location-free use and device-free use make users with this work style another target of OiC services.

2.3 Function configuration

The configuration of OiC features is shown in **Fig. 2**. Here, the user purchases desired services at an electronic commerce (EC) site provided by the *EC portal* function denoted by (1) in the figure. This site adopts a style similar to traditional EC sites; it prepares a wide variety of applications in each service category with the aim of absorbing the long-tail layer in the provided products. Function (2), *provision of support services*, enables responses to user inquiries and service recommendations to be made, and also allows swift user support. Since user-support services are already expanding at NTT business companies, we foresee the linking of this function with those services. Function (3), *provision of web applications*, executes web applications provided by OiC. This function also has an interface for achieving SaaS + CaaS services such as by establishing interconnectivity between web applications and the telephone network. We mention here that OiC is expected to provide third-party services in addition to NTT services, and the mechanism for doing so is function (4), *third-party linking*. Function (5), *device configuration discovery*, is useful for users who have office space since it can manage the types and states of devices used in the office. In this way, efficient user support for any problems discovered in those devices can be provided through function (2), provision of support services. Function (6), *customer information management*, manages information related to OiC users to facilitate efficient user support. It manages basic information such as user name and location and information related to services being used and generates recommendation information on services that the user is deemed likely to need. Finally, function (7), *terminal authentication*, deals with the use of terminals not normally used by the user by verifying that a

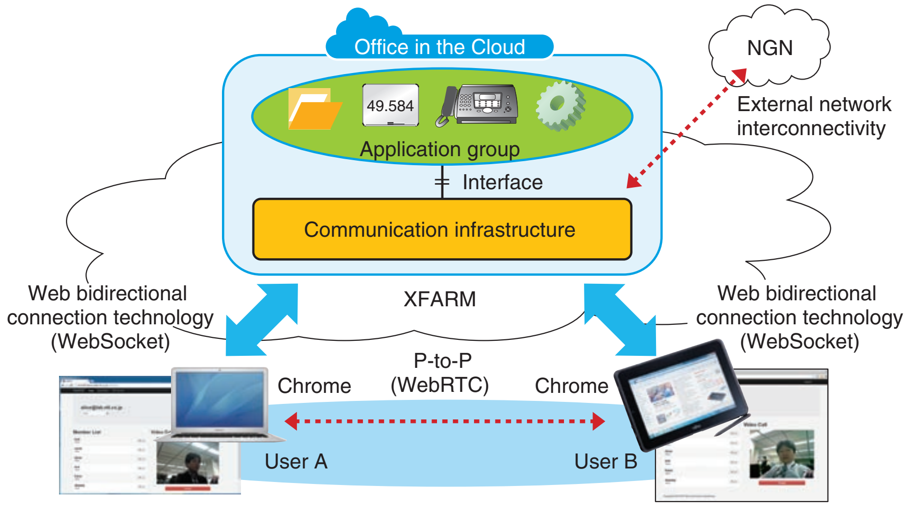

Fig. 3. Prototype implementation.

particular terminal is indeed a terminal that a particular user is trying to use. Having a server for executing this function enables the user to safely display information on devices and equipment installed at a client's office, in a hotel room, or elsewhere.

3. Prototype implementation

We focused on functions (3) and (7) from the OiC constituent functions to implement an OiC prototype service having the features described above on the XFARM platform constructed and operated by NTT laboratories, as shown in **Fig. 3**. With a view to satisfying WebRTC implementation conditions, we chose Chrome as the target browser of this prototype. All elements of this OiC prototype system other than user terminals were implemented on XFARM. The system was divided into a communications infrastructure for achieving RTC services and an application group for achieving SaaS, and an interface was inserted between these two sections to provide SaaS + CaaS services. The section that executes the application group has a mechanism that simplifies application development by third parties and that makes it easy to develop applications that link with other applications or RTC services. The communications infrastructure, meanwhile, achieves interconnectivity with conventional carrier services and allows for calls to be made via NTT's HIKARI DENWA (optical IP telephony) service. This implementation also uses open-source IP-PBX in the RTC section and applies the HTML5 content division/linking technology [4] developed by NTT laboratories in the terminal-linking section.

In addition to implementing open-source IP-PBX (IP private branch exchange), we are moving forward on implementing the RTC section with a number of off-the-shelf technologies. We are currently in the function-evaluation stage.

4. Example of service visualization

Using the prototype described above, we visualized what basic OiC services might look like. In this visualization exercise, we installed several web applications and basic RTC functions. One example of such a service is a portable document format (PDF) file-sharing service as shown in **Fig. 4**. This is an application that enables users to share PDF files via a web browser and to synchronize page turning, scrolling, etc. To manipulate a shared file, users need to communicate with each other through simultaneous use of RTC services. This requirement was satisfied using the application-development mechanism described above to display a small video image of the other party in the upper-right portion of the browser window.

It must also be considered that a WebRTC browser session would normally be cut off when moving to another page such as when switching from the PDF-file-sharing service to another service, which would require the user to reestablish connection with the other party. In OiC, we have solved this problem by incorporating a mechanism for switching web applications without opening a new tag.

Fig. 4. Example of OiC service (PDF file sharing).

5. Future outlook

To date, we have been examining the feasibility of the OiC service concept by constructing a prototype system and evaluating functions. Going forward, we plan to accelerate our studies toward the commercialization of OiC from both service and technical viewpoints. First, from a service perspective, we will concentrate on SaaS + CaaS services since they represent those services for the SMB domain—the OiC target—that differentiate OiC from existing services. Then, from a technical perspective, we will address remaining issues in user authentication and terminal authentication by promoting security-related studies in collaboration with other research organizations.

As of April 2013, there are only two WebRTC-supporting browsers: Chrome and Firefox. However, other compatible browsers are expected to be launched soon (i.e., new browsers), which should help accelerate the spread of WebRTC. We will continue our work in visualizing OiC services while noting the flow of such off-the-shelf technologies and considering how commercially available technologies and products can work with OiC.

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Sweet Digital Home: Enhancing Family Life with HIKARI and Cloud

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Abstract

To promote the further spread of the fiber-to-the-home (FTTH) network typified by the FLET'S HIKARI optical broadband service, there is a need for home services that can demonstrate the appeal of FTTH to general customers and persuade them to use HIKARI services over the long term. This article introduces the Sweet Digital Home (SDH) concept of visualizing and creating diverse home services to create a more comfortable family life. The goal here is to achieve advanced home services that are easy enough for anyone in the family to use based on a *family cloud* connected to the home via FTTH. This cloud will enable a wide range of family-related information to be collected and used across many services.

1. Introduction

Optical broadband services have been expanding steadily, as reflected by the more than 17.1 million subscribers (December 2012) to the FLET'S HIKARI* optical broadband service. However, if optical broadband is to spread even more, it is essential to provide attractive services that demonstrate the outstanding features of fiber-to-the-home (FTTH) technology so that existing FTTH customers will continue to subscribe for many years to come. One approach that NTT Service Evolution Laboratories is taking to realize such services is to visualize a variety of services based on the Sweet Digital Home (SDH) concept. This concept is targeted at home users, who make up a significant potion of NTT's line subscribers, and is aimed at creating services that combine FTTH and a family-dedicated cloud (the *family cloud*). Such SDH services are intended to provide an environment in which family members can easily access the various types of data that are generated in daily life (digital photos, lifelogs, etc.) and stored on the family cloud over a high-quality broadband FTTH network [1]. However, the idea here is not simply to facilitate the storage and delivery of data through online storage. It is also to provide home services that add value to the data and that enable the data to be used in a straightforward and convenient manner using technologies developed by NTT laboratories and other service providers. We are now in the process of visualizing services based on the hypothesis that new home services based on the SDH concept will enable users to feel the true value of FTTH and will make everyday life even more convenient, pleasant, and comfortable the more that these services are used.

2. SDH service architecture

The detailed architecture of SDH services needs to be planned based on specific needs and usage environments, but we can consider it to have the basic configuration shown in **Fig. 1**.

These services will mainly target families that are already subscribing to an optical broadband service such as FLET'S HIKARI. We design the services to connect the family with the family cloud directly via the carrier's managed network without the Internet as an intermediary. This type of configuration achieves

* "Hikari" is the Japanese word for "light".

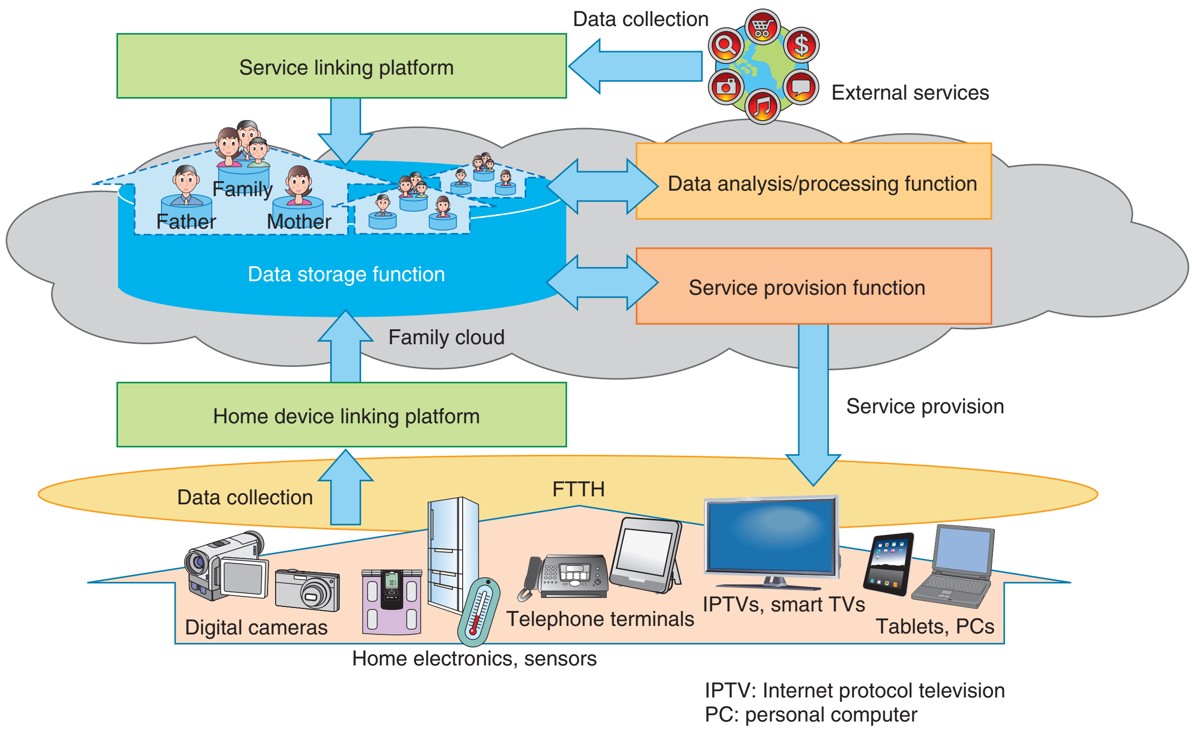

Fig. 1. SDH service architecture.

a high level of security compared with online storage services that are now proliferating on the Internet. Additionally, the wideband characteristics of optical broadband as well as the high quality of a managed network (low delay, low loss, etc.) make for stress-free use of data-intensive content such as high-definition video.

Here, it is important that the process of collecting data for the family cloud be trouble-free if home users without any detailed knowledge of information and communications technology (ICT) are to feel comfortable using SDH services. In these services, data will be collected mainly from the family's home devices and from external services on the Internet using existing technologies such as a home device management platform (Home ICT etc.) and a service federation platform (OAuth etc.), respectively.

The family cloud consists of three main functional blocks: a data storage function, data processing function, and service provision function. The data storage function stores user data in different storage areas, for example, in one for individual use and in another for family-wide use. Data sharing is facilitated in different ways such as between families and between family members living in the same home or in different places. The system controls the exchange of data between users for this reason. Furthermore, in addition to these standard online storage functions, the system will combine the data storage and the data processing function described below to perform advanced data processing such as recognizing data content and automatically adding annotations, learning user tastes and preferences from data-usage trends, etc.

The data processing function consists of many engines that are elemental technologies transformed into reusable software modules for adding value and original features to stored data and services provided to users. These technologies consist of unique technologies developed by NTT laboratories and technologies that have been evaluated and studied in cooperation with outside organizations through open-innovation programs.

The purpose of the service provision function, meanwhile, is to execute a variety of SDH services and provide them to the family as cloud services. Although the terminal software (user interface etc.) required for each service must be delivered to home terminals (such as telephones, televisions, tablets, and smartphones), technologies such as HTML5

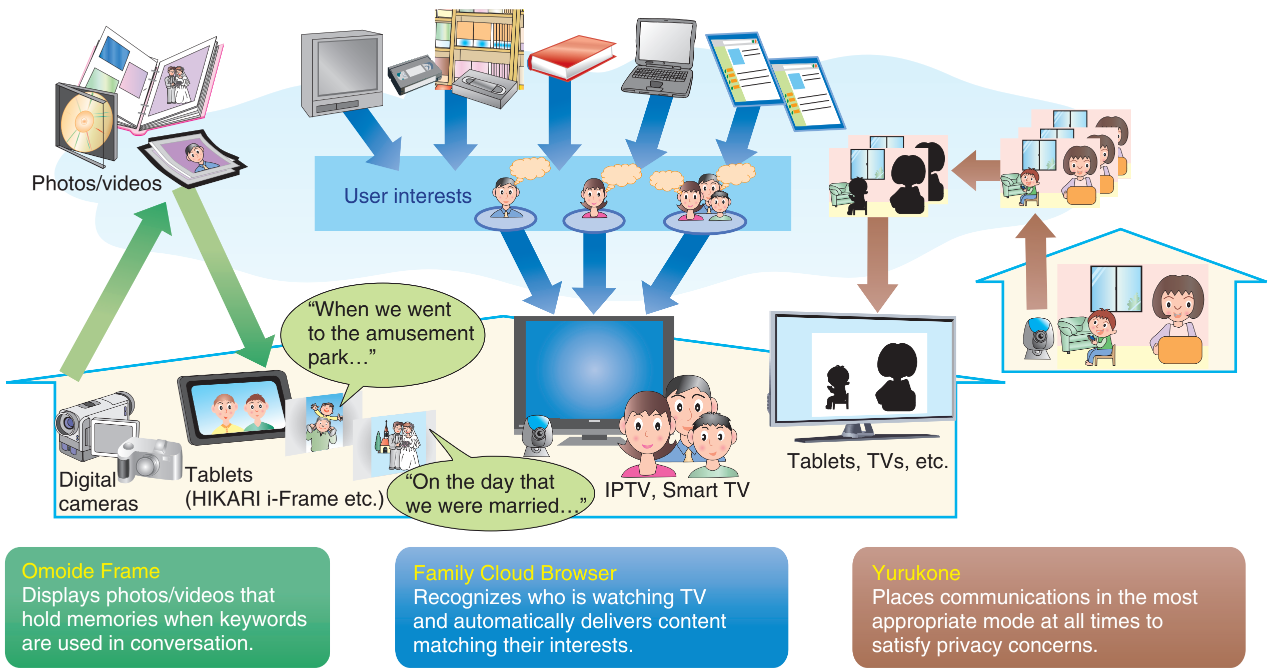

Fig. 2. SDH service examples.

(hypertext markup language version 5) help to minimize the configuring and upgrading of terminals when using new services with different functions.

3. Examples of SDH service visualization

We have considered several services based on the SDH concept and have constructed a prototype system for demonstration purposes. We introduce here *Omoide Frame* and *Family Cloud Browser* as services that make browsing of content on the family cloud more convenient, and *Yurukone*, an advanced communication service using data on the family cloud (**Fig. 2**).

3.1 Omoide Frame

What first comes to mind when considering the types of data that can be stored in the family cloud are photos and videos taken by users themselves. In many families, photos and videos taken with a digital camera or smartphone are simply left on the device's memory card. Some ICT-savvy users may transfer their content to a personal computer and manage it there, while others may use an online storage service. In any case, finding photos or videos that one wants to view involves some work, namely, turning on the digital camera or personal computer, searching through old folders for the desired content, and launching an application to display it. The amount of work necessary to do this discourages many people from doing so, and thus limits the opportunities to see one's photos and videos. It often happens that a photo or video is never viewed again after being taken. Moreover, while it is possible to display slide shows through the use of a digital photo frame, the content is usually displayed in a random manner. This method is therefore not conducive to viewing what one wants to view when one wants to view it.

However, everyday activities in a household, for example, family members having conversations and watching television programs together in the living room, can stimulate spontaneous memories of past family activities. Even the day's weather can remind people of past events. If photos and videos related to those memories can be presented at the time those recollections occur, a new way of enjoying photos and videos that keeps past memories close at heart can be achieved. The Omoide Frame service can display a slide show of family pictures stored on the family cloud using a digital photo frame and can narrow down the photos displayed by using speech recognition technology to recognize user-spoken keywords such as *trip*, *father*, and *park*. Plus, in addition to receiving input using spoken keywords, the service provides an interface for selecting photos through touch operations on a tablet computer to enable more complex searches using keywords such as *AND-search* and to support a non-targeted, casual style of browsing for viewing photos.

3.2 Family Cloud Browser

Data stored on the family cloud can be quite diverse. In addition to photos and videos taken by users themselves, the data can include personal blogs and business sites on the Internet, video content such as video clips from the Internet and video on demand (VOD), and e-books. The family cloud can also be expected to collect data automatically on behalf of users and to deliver advertisements, the latest news, and other information from external sources. The family cloud can also be configured to enable the storage of information for referencing external data with links and bookmarks, thereby negating the need to store the data itself. In this case, the actual data are retrieved from an external site.

However, accommodating such a wide range of data in a family cloud in this way would generally make it very difficult for the user to decide what to view or to search for desired content. At present, search services and word-of-mouth discussions through social network services (SNSs) provide an effective means of finding the content that one wants to watch, but using such services can still be a challenge for middle-aged and elderly people who are unskilled in ICT. For this reason, the Family Cloud Browser adopts a TV user interface that most people are familiar with to deliver content for viewing by individual family members or by the entire family in the manner of a *user-dedicated channel* that collects content regardless of its source (TV, blogs, Internet-based video, e-books, etc.). Here, we use lifelog technology to assist in the content-selection process. This technology learns about the interests of users from their browsing history and determines the extent to which each content item matches user interests. At present, learning about the interests and preferences of users and presenting a user-dedicated channel requires some means of recognizing which users are sitting in front of the TV screen. To this end, we use a technology for determining the number of people present and the age and gender of the individuals in question.

3.3 Yurukone

A number of households consisting of family members, friends, etc., may be using SDH services, and we therefore feel that a variety of communication services could be achieved if the data stored in family clouds could be shared among those households. The Yurukone service enables data from cameras or sensors inside a home to be shared with other homes as presence information so as to provide a loosely coupled, always-on communication environment that can supplement high-quality telephones or videophones. For example, images obtained from a videophone camera could be transformed into silhouettes through image processing and then shared so that one could convey what one is doing and whether one is busy or free without having to worry how one looks. Then, after communicating at such an abstract level, one could switch to a high-definition videophone as needed with just one click.

4. Future developments

Our work in developing SDH services is currently in the service-concept creation phase, and a number of technical issues still remain. For example, technology for automatically uploading and classifying digital photos is necessary to achieve our objective of providing services easy enough for any member of the family to use. We are presently evaluating elemental technologies and studying methods for incorporating them into services.

In addition, there are many areas in everyday family life that can be supported by SDH services such as medical care, health, safety and security, and education. Our aim is to create a service domain that can provide comprehensive support toward a more comfortable and pleasant life based on a common framework of HIKARI + family cloud.

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SightX: Obtaining Information on a Scene by Pointing a Camera

Daichi Namikawa, Hiroya Minami, Haruno Kataoka, Motohiro Makiguchi, and Michio Shimomura

Abstract

This article describes the SightX communication service, which gives the user access to information without requiring the use of language. SightX allows users to obtain information about objects that they see in front of them when they do not know the name of the object or when they feel uncomfortable speaking into a device for information retrieval. With SightX, the user simply points the camera of a smart device at an object to retrieve information about it.

1. Introduction

The widespread use of smart devices and the development of mobile networks in recent years have created an environment that allows users to access information from anywhere at anytime. In the past, search services based on typed-in text keywords have been used widely, but recently, services that provide information after accepting voice input of questions have been introduced [1]. Nevertheless, when suitable keywords do not come to mind, or in situations where input by typing or speaking is inconvenient, it is not possible to make full use of the smart device and mobile network. To solve this problem, we are implementing a communication service called SightX that enables the user to access required information on a scene without having to use language input. The goal is to achieve our service vision of providing *services for media editing and conversion during real-time communication* (*RTC*).

2. Service overview

2.1 Concept

SightX enables users to obtain information about objects that they encounter by simply pointing the camera of a smart device* at the object when they do not know what it is called or when they feel uncomfortable using a speech interface. The user can thus retrieve information at any time without using language input. To ensure that this service can be used by various smart devices, old or new, complex processing is performed on the cloud by a high-performance server. This service incorporates the concepts of sight and exploration, as well as expansion of recognition and the field of view, as reflected in the name SightX.

2.2 Use scenarios

Here we introduce a few SightX use scenarios in detail, describe the information provided to the user, and present some specific examples. We begin with cases in which the name of an object is not known.

(1) Commercial products in department stores and specialty stores

This service can provide the user with basic information such as the name and price of products that have a form that is unfamiliar to the user and whose name or use is not known, such as kitchen appliances that have an elaborate design. The user need only point the camera at the product to obtain the information (**Fig. 1(a)**). For luxury goods such as wine and Japanese liquors, knowing the name and price is not enough to understand the product, so further details such as flavor and customer reviews are also provided (**Fig. 1(b)**).

* Smart device: A multifunction communication device such as a smartphone or tablet terminal

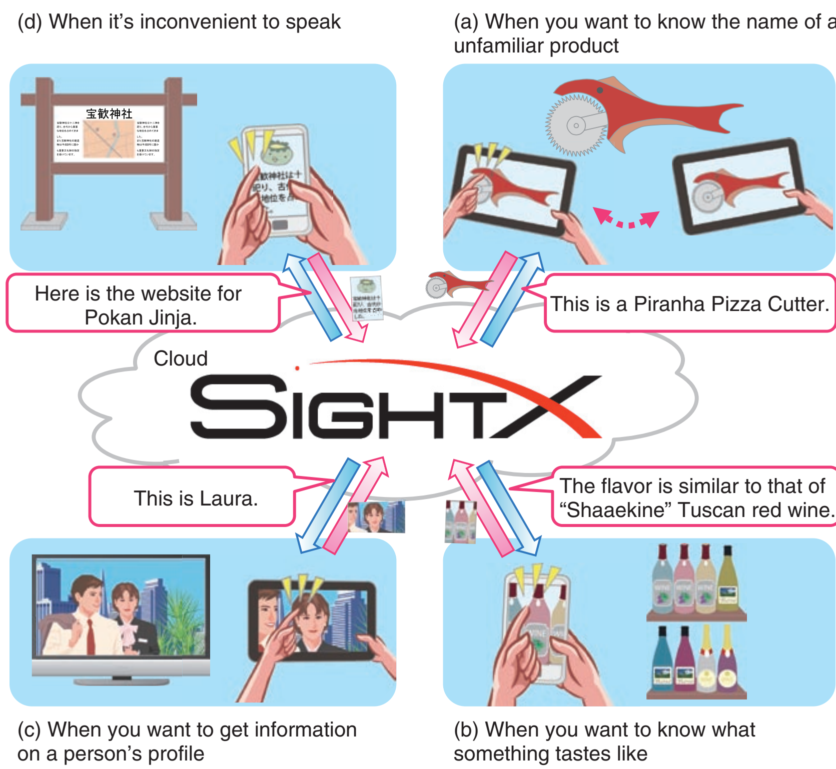

Fig. 1. Examples of using SightX.

(2) Persons whose names are not known or cannot be recalled

For famous people that appear on TV and in magazines and whose names are not known, the service provides a profile that includes the person's name, age, and affiliation when the camera is pointed at their face (**Fig. 1(c)**).

SightX can also be used in crowds, in vehicles, in public areas, or in other situations where it is inconvenient to use a voice interface to ask a question.

(3) Signs at tourist sites or shops

When the camera is pointed at a sign in a tourist site or in a shop, the gist of the information and the current location can be presented, along with relevant websites and other such information (**Fig. 1(d)**). For shop signs, information such as the type of shop and its reputation among customers, obtained through customer reviews, is provided.

Typically, restaurant review websites include the rating (score) of the restaurant, and a collection of customer opinions about the quality of the food, the service, the atmosphere, etc.

SightX thus provides a wide range of knowledge based on the object of interest and the user's situation.

3. Function configuration

The SightX functions are configured as described below (**Fig. 2**).

(1) Real-time video transmission function

Video taken by the user with a smart device is sent to a server on the cloud in real time.

(2) Video recognition function

The server on the cloud runs multiple video recognition engines that have different characteristics in parallel in order to recognize various kinds of objects and people in real-time video sent from a smart device and to respond to the user query, "What is this?"

(3) Knowledge processing function

On the basis of the results obtained by the video recognition engine, information about the recognized object is generated to present to the user. Here, too, multiple types of knowledge processing engines run in parallel so that a wide range of information can be

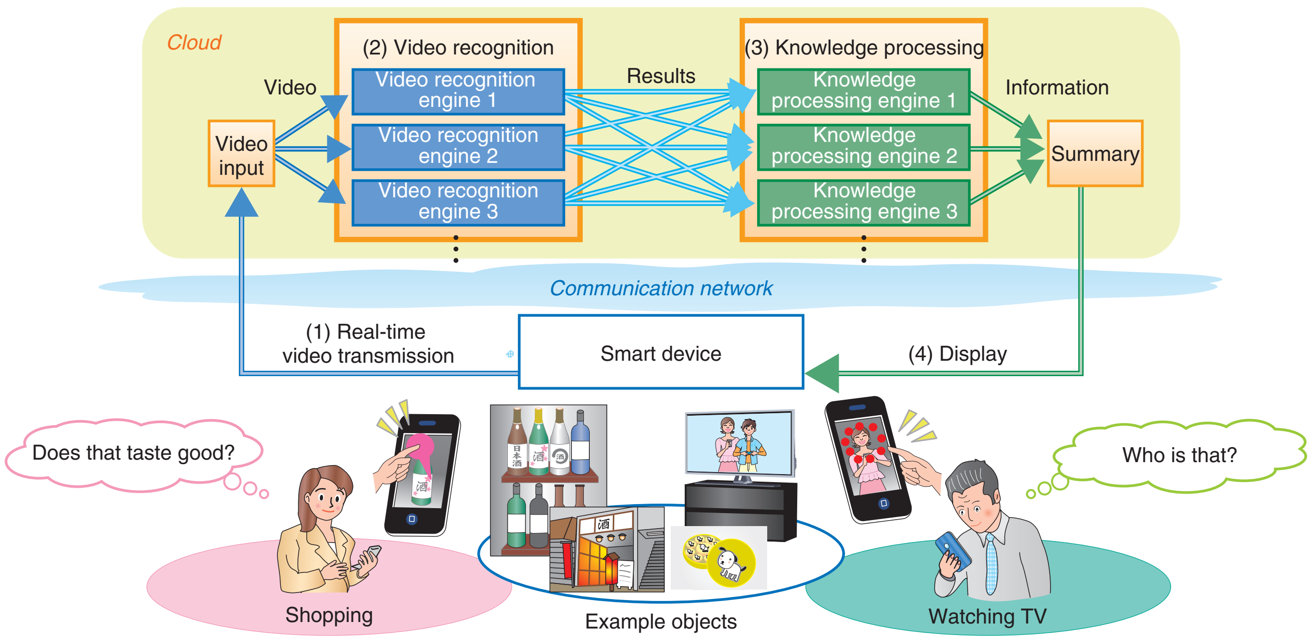

Fig. 2. Function configuration of SightX.

generated.

(4) Information display function

The information generated by the knowledge processing engine is received by the smart device and displayed on its screen.

In this way, the only functions the user's device require are for acquiring video in real time, sending and receiving data, and displaying the information on the screen. These functions are provided by older devices as well as the latest devices. Furthermore, the video recognition function and the knowledge processing function are configured from several kinds of video recognition and knowledge processing engines arranged in multiple layers on the cloud. That makes it possible to retrieve information on diverse recognition targets when the user simply points the device camera, without distinguishing between the services involved. Individual engines can also be added as the recognition targets and generated information are added or changed, and the targets are not limited to those mentioned in the use scenarios described in the previous section. For example, if there is a future need to recognize people's emotions, a facial expression recognition engine can be added.

4. Prototype implementation

We have put together relevant technology from the NTT research laboratories and other sources to implement a SightX prototype that allows actual testing of the use scenarios presented as examples in the previous section. Below, we describe the operation of the user interface and the video and knowledge processing engines that are used in the current prototype.

4.1 User interface

When the user points the camera at something they want to know about, information (e.g., a name) is superimposed on the device screen in the form of augmented reality (AR) icons. The user can tap on an AR icon to switch the information, such as from a name to a price. Pressing on an icon for a few seconds will open a tab window that presents more information (**Fig. 3**).

4.2 Video recognition engine

This capability uses an object recognition engine that recognizes and matches objects in two dimensions, a face recognition engine that determines who a person is from an image of their face, and English and Japanese character recognition engines. The character recognition engine in particular can identify

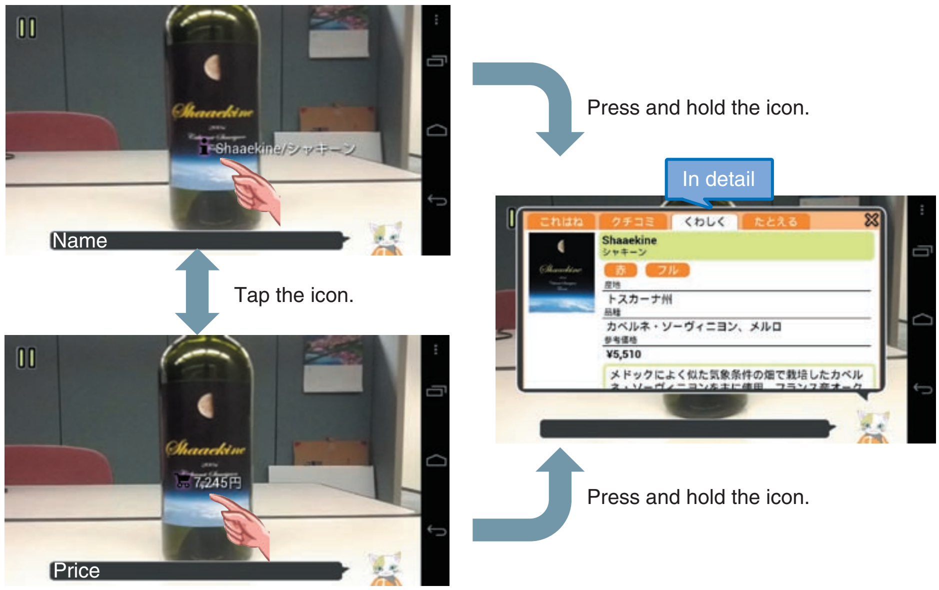

Fig. 3. Operation of user interface.

text sections within documents by taking the text column structure into account [3].

4.3 Knowledge processing engine

In addition to a search engine for gathering basic information such as the names of products and shops, there is a sensibility communication engine, which aids understanding by using life-log information such as purchase information and whether a product, shop atmosphere, or other thing seen for the first time corresponds to something in the user's past experience [4], [5]. There is also a word-of-mouth summary engine, which can analyze different kinds of evaluative information (known as word-of-mouth information) on a product or shop to create a short summary that can be displayed on the small screen of a smart device [6].

5. Conclusion and future development

We will continue to work towards implementing SightX as a communication service that enables users to access information without using language. We have so far implemented a prototype that allows users to get a feel for using SightX through actual experience and are promoting the visibility of the SightX service image.

In the future, we will cooperate with businesses in conducting field trials that give customers opportunities to actually use the service, and, in parallel with those trials, we will continue working on improving the elemental technologies of video recognition and knowledge processing and the application to wearable devices and other new devices.

For the trials, we first intend to increase the accuracy of the video recognition and knowledge processing functions and to stabilize the operation of the prototype system. The opinions from users and the overall knowledge obtained from the trials will serve as a basis for developing new use scenarios as well as providing feedback on the research and development (R&D) of the elemental technologies. Furthermore, the technical issues that are revealed will be used in discussing the direction of future R&D of the elemental technologies.

An example of a new elemental technology and device planned for incorporation is the application of three-dimensional (3D) object recognition [7], [8] in the video recognition engine. This technology enables recognition of 3D objects from a small number of training images, so it can be applied for uses that require recognition of various 3D objects. To make it possible to infer the user's circumstances or interests and select information that they truly want, we are also investigating the application of this technology to glasses-type camera devices that allow video to be captured from the user's actual viewpoint and field of view.

SightX features a high degree of generality due to the ability to flexibly change processing engines according to the addition of recognition targets or the information to be generated, or according to changes in either. There are probably use scenarios for solving various problems and tasks at places near the user that we cannot foresee. We would therefore like to implement communication services that have value in raising the visibility of the service vision by flexibly incorporating the opinions and requests of customers and businesses in expanding the range of application services.

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The XFARM Platform for Faster Service Creation

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Abstract

The NTT Service Innovation Laboratory Group is cooperating with Group companies to construct a research and development (R&D) cloud platform called XFARM (pronounced "cross farm") that is equipped with a set of service prototypes and a set of components such as processing engines to provide an environment for conducting demonstrations and trials outside the research laboratory. This is intended to achieve rapid implementation and verification of R&D technology trials. This article describes the XFARM platform for creating services on the cloud.

1. Introduction

The NTT Service Innovation Laboratory Group is promoting service proposals that combine NTT research and development (R&D) technology, outside technology from other research organizations, and commercial products and is also providing an environment that allows rapid service trials.

We are constructing a common cloud service platform as an environment that will allow rapid implementation of product and service trials and make it easier to visualize potential services. XFARM (pronounced "cross farm") is the general name given to this cloud platform, as well as the applications built on it and various components such as research laboratory development engines. The name XFARM is intended to capture the idea of a place for unleashing the collective power of the NTT Group companies and research laboratories to create a stream of new productive possibilities. We have also designed a representative logo (**Fig. 1**) and are working to broaden recognition of the platform.

In recent years, it has become increasingly important to have a lean startup approach to R&D and service development. The term *lean startup* means to build up a service idea in a short time and to use a cycle of rapid implementation of verification testing and trials and application of the knowledge obtained from them to further improve services. XFARM is an environment for supporting such rapid R&D and service development.

XFARM is a cloud-era service creation environment that makes technology that is available on the market and technology that is produced by research laboratories available as service components and prototypes. It enables the development of unprecedented new services and even services that have not occurred to the developers themselves. It achieves this through facilitating various combinations of technologies, services, and content and field trials that allow feedback of the opinions of many users in the development process.

XFARM also serves as an environment for development and verification within the research

Fig. 1. XFARM logo.

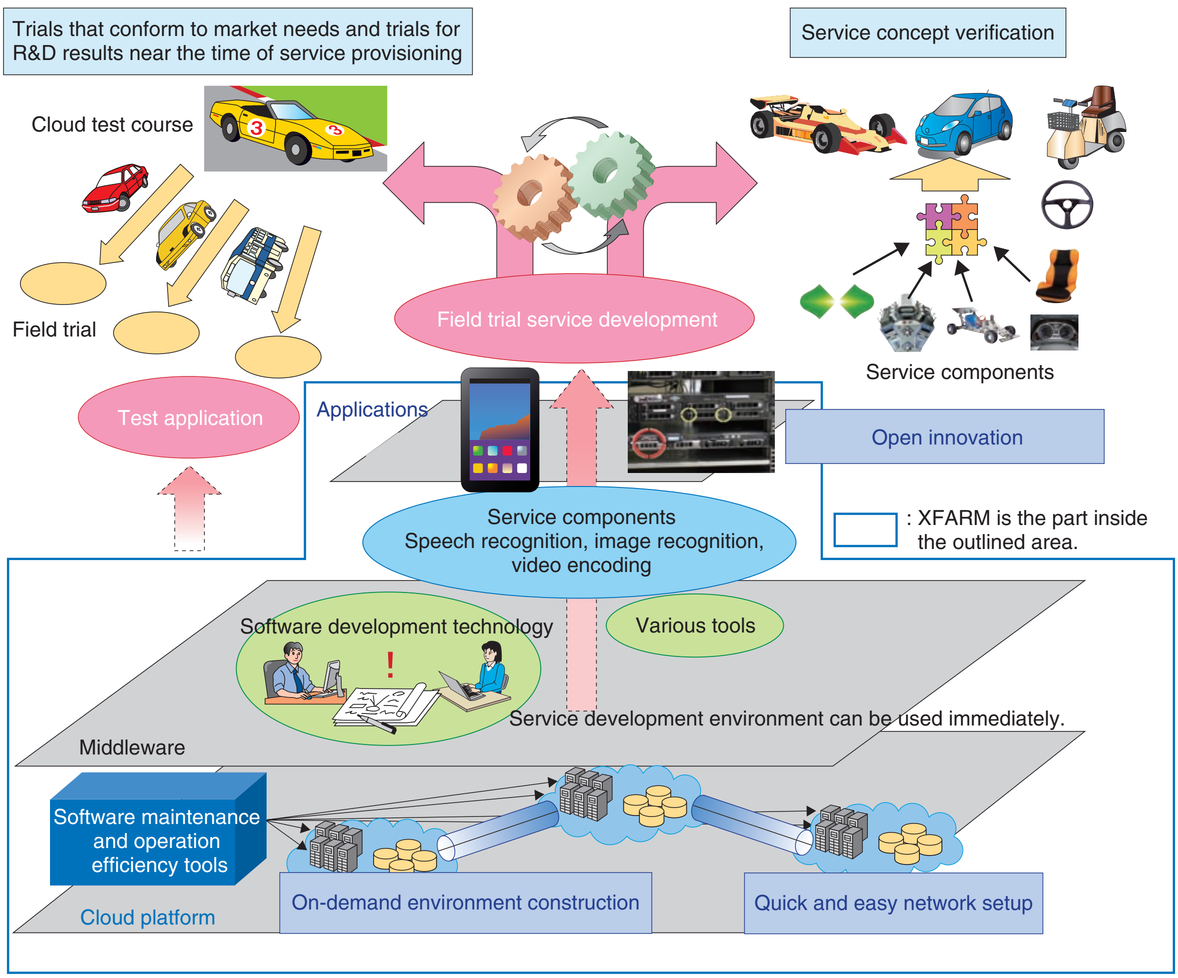

Fig. 2. Overview of XFARM configuration.

laboratory. The sharing of functions in a cloud environment offers various benefits, such as reduced costs, stimulation of a fusion of new service ideas and creativity through the sharing of research development engines, and greater agility in conducting exhibitions and demonstrations.

2. XFARM configuration

XFARM mainly comprises a cloud platform and applications (**Fig. 2**) that can provide an optimum environment for various use scenarios.

2.1 Cloud platform

The cloud platform uses the server resources of the existing R&D cloud [1] to provide a virtual environment and allow efficient use of resources and rapid provisioning. The service menu includes various combinations of virtual machine (VM) plans that offer varying numbers of vCPUs (virtual central processing units), memory capacities, root-disk capacities, guest OS (operating system) templates, and network services. To facilitate the construction of trial environments and reduce the amount of resources used, the NTP (network time protocol), DNS (domain name system), a yum repository service, and other such functions are provided as common functions.

2.2 Applications

Applications have been constructed to enable the use of research laboratory development applications (mainly visibility enhancing products) and research laboratory development engines such as for speech recognition, image recognition, and video encoding. Applications are basically constructed in a virtual environment, but XFARM also provides an environment that enables seamless use of virtual environments and real environments to handle cases in which architectural or functional constraints make the use of a virtual environment inappropriate. XFARM thus allows unified trials.

We are also completing a network environment that will enable XFARM to provide for flexible implementation of demonstrations, exhibitions, and trials through selection of various forms of networks with connections to a virtual private network (VPN), the Internet, and other network resources to match the needs of customers for whom the trial is designed. By allowing access to the GEMnet 2 (Global Enhanced Multifunctional Network 2) global research network [2], global-level trials with access from North America and other places can also be conducted in a short time when a service environment is constructed on XFARM.

3. Features of XFARM

XFARM has several advantageous features; we focus here on readiness, flexibility, adaptability, and low-cost construction.

3.1 Readiness

Fast provisioning is possible because XFARM is pre-equipped with service components and prototypes. We are working towards achieving the ability to implement trials within one month from the planning stage to the start of trials at a quality level that involves about 100 users.

3.2 Flexibility

The results of research and development and on-the-market technology etc. are made available in the form of service components and prototypes that can be combined quickly and flexibly in a variety of ways for rapid implementation. We are also investigating ways to maximize compatibility with the service provisioning environments of the NTT group to further shorten the time from when R&D results are provided to the business companies to when services are offered.

3.3 Adaptability

Because services can be developed on XFARM and trials of the new services can be implemented without further modification, it is possible to go beyond bench-top testing to verify actual marketability. Efficient (rapid) development in which service ideas and concepts can be improved by quickly adapting to market trends is also possible.

3.4 Low-cost construction

XFARM provides a low-cost cloud platform that combines advanced research technology and on-the-market technology and allows full use of the advantages of the cloud platform to obtain the benefits of a centralized virtual environment and peripheral network environment in order to reduce development costs.

4. XFARM use scenarios

The XFARM use scenarios include various ways of using the platform.

In the initial stage of research and development, XFARM provides an environment for development and verification that reduces the cost and shortens the time of constructing environments by sharing resources. In the stage where there is some degree of progress in research and development, and applications and processing engines can be used, trials can be conducted in environments that assume specific services. Joint testing for mutual purposes that involves the research laboratory and outside organizations is also possible.

XFARM is thus a platform that can be used in all stages of the service incubation cycle, from R&D to commercial service trials.

5. Trials with XFARM

5.1 XFARM service level

The NTT research laboratories have been implementing a service level agreement (SLA) for assuring service quality (**Table 1**) in service trials. The SLA serves to specify the level of service provisioning with items such as the examples presented in the table so that trials can be conducted without concern by XFARM users. An operation and maintenance system, monitoring system, and other such facilities are also provided to ensure stable service trials.

A high level of software quality of the applications used in service trials is maintained, and only applications that conform to the in-laboratory development standards and that satisfy verification testing and business company trial standards are provided.

5.2 Actual results from using XFARM

The use of XFARM has already started in some demonstrations, exhibitions, and service trials for

Table 1. Examples of SLA items.

Item	Description
Service time	Service hours in which users can use a service trial
Support time (questions and failure reporting)	Time period for user questions and problem support (failures etc.)
Failure recovery time	Target time for recovery when problems (failures etc.) occur
Inquiry response time	Time for situation reports in response to questions and failure reports (operations process service)
Configuration change	Addition of use sites etc. (requires consultation)
Data backup	Back-up of system configuration information etc. (requires consultation)

customers outside the research laboratory. This is possible because XFARM takes advantage of the agility afforded by the cloud platform. Applications that connect to XFARM put service concepts into concrete form in showroom demonstrations and exhibitions. XFARM is thus used as a tool for making day-to-day proposals to customers in relation to future business. These trials also give customers an opportunity to voice their opinions and needs with respect to the exhibitions, thus providing the research laboratory with feedback that can be applied in the next round of R&D.

Previously, necessary tasks ranging from identifying issues and designing networks to actually constructing a system have been coordinated individually when conducting demonstrations, exhibitions, and trials. That has resulted in waste through replication of work. However, applications constructed on the XFARM platform have been handled in as little as a single day or within several days, which shows the steady progress we are making in shortening this process.

6. Future development

In the future development of XFARM, we will add applications and processing engines and implement more trial conditions. The environment for using XFARM will also be continuously improved and expanded to provide greater convenience to both trial users and researchers and developers and to provide services that offer a high degree of satisfaction.

Although XFARM was begun as a service to be used in Japan, our plan is for the platform to serve as a global development tool for R&D. Even now, global use is possible via Internet VPN and other such mechanisms, but we are investigating future expansion to overseas bases as well.

With all members of the NTT Group as value partners, we will push forward into the future while building XFARM into a platform for creating services that please customers.

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Cloud Standardization Trends and Inter-cloud Techniques in ITU-T

Bo Hu

Abstract

Study Group 13 (SG13) of the International Telecommunication Union, Telecommunication Standardization Sector (ITU-T) is reviewing architectures such as those of Future Networks and drawing up cloud standardization specifications in order to design the optimal network when providing services. This article introduces the ITU-T SG13 Recommendations that have been completed through cloud linkages and gives an overview of draft reports that are under review. Additionally, the concepts and specification details of inter-cloud techniques for implementing highly reliable cloud infrastructures being promoted, centering on Japan, are described.

1. Overview of ITU-T cloud standardization

Study Group 13 (SG13) of the International Telecommunication Union, Telecommunication Standardization Sector (ITU-T) is reviewing the architectures of networks such as the Next Generation Network (NGN) and Future Networks [1]. Cloud computing has become increasingly popular recently as virtualization techniques have progressed and business models have matured, and computational resource usage has entered a new era. An important topic for ITU-T SG13 is the optimal network design when providing cloud services, and against that background, we have set up three review tasks and have started drawing up standards relating to clouds from the telecommunications aspect. The scope of the review tasks includes cloud ecosystems, general requirements, functional requirements, and architectures. At SG13 meetings, at least 50 specialists from telecommunications carriers and vendors of software and network equipment gather and engage in active debate. As a result, general requirements for clouds (Y.3501), functional requirements for cloud infrastructure management (Y.3510), and functional requirements for cloud resource management (Y.3520) have been completed as ITU-T Recommendations. Future aims include completing the standardization of individual techniques and service fields such as Infrastructure as a Service (IaaS) and inter-cloud services.

In addition, a collaborative team (CT) has been formed with the cloud related group Subcommittee 38 (SC38) of the Joint Technical Committee 1 (JTC1) of the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC), and a collaborative review is underway into cloud terminology and reference architectures to form common documents [2]. The results of this collaborative review are scheduled to become standardization documents for both fields.

2. Overview of cloud recommendations

The current group of cloud related recommendations for ITU-T SG13 is shown in **Fig. 1**. Documents CT-CCVOCAB and CT-CCRA of the collaborative team with ISO/IEC review the terminology and reference architecture that are the foundations of the cloud standard and that are applied in common to all the ITU-T Recommendations. Among the draft Recommendations that are subject to ITU-T independent review, Y.3501 stipulates the broader concepts of each field to give an overall picture of clouds, and the others stipulate detailed specifications of individual fields. In addition, draft Recommendations Y.e2ecslm and Y.e2ecmrgb are currently being reviewed as recommendations derived from the resource management of Y.3520. An overview of these recommenda-

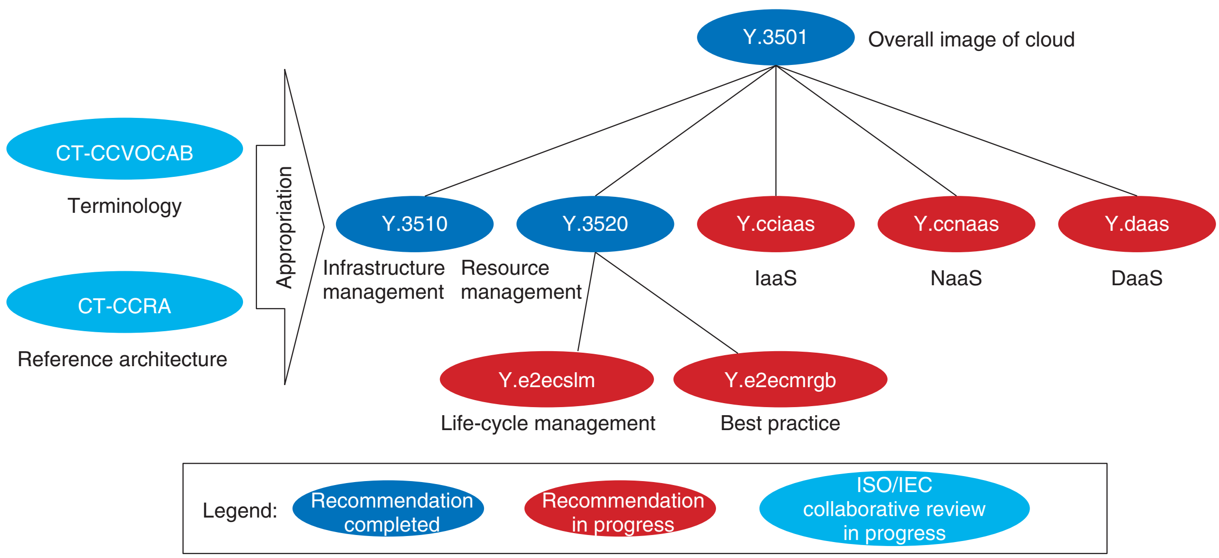

Fig. 1. ITU-T SG13 cloud linkage recommendations.

Table 1. Overview of ITU-T cloud recommendations.

Recommendation No.	Summary	Note
CT-CCVOCAB	Stipulates basic cloud terminology and definitions of ecosystems that represent the roles of providers, customers, etc.	ISO/IEC collaborative review
CT-CCRA	Stipulates reference architecture that shows the positioning within the overall image of each function and associations between functions, for functions such as service provision and resource preparation.	ISO/IEC collaborative review
Y.3501 (Y.ccf)	Derives general requirements based on abstracted use cases of cloud techniques and service fields, and stipulates an overall image of the cloud. Stipulates both requirements common to all services, such as life-cycle management and security, and requirements that are special to fields such as IaaS and Inter-clouds.	Editor: Bo HU (NTT)
Y.3510 (Y.ccInfra)	Subordinate part of cloud architecture—stipulates functional requirements and orchestration relating to the three types of resource for parts that provide installation infrastructure: computing, storage, and networks.	-
Y.3520 (Y.e2eccrmr)	Recommendation Y.3520 stipulates integrated management of services and resources in an end-to-end manner with respect to services configured on one or a number of cloud systems, with the aim of providing applications in the upper layers.	-
Y.ccic	Focuses on resource utilization of net and infrastructure and stipulates the framework of an Inter-cloud that links together a number of IaaS and Network as a Service (NaaS) business operators.	Editor: Naotaka MORITA (NTT)
Y.DaaS	Customized for typical cloud services—stipulates the functional requirements and architecture necessary for providing services, based on use cases that are more detailed, for each of the IaaS, NaaS, and Desktop as a Service (DaaS) fields.	-
Y.ccIaaS		
Y.ccNaaS		
Y.e2ecslm-Req	Stipulates frameworks and functional requirements for the life-cycle management of clouds and services.	-
Y.e2ecmrgb	Reviews methods of implementing end-to-end management by best practices.	-

NaaS: Network as a Service
DaaS: Desktop as a Service

tions is listed in **Table 1**.

Functional requirements and architectures such as Software as a Service (SaaS) and BigData as a Service (BDaaS: B desktop as a service) positioned in

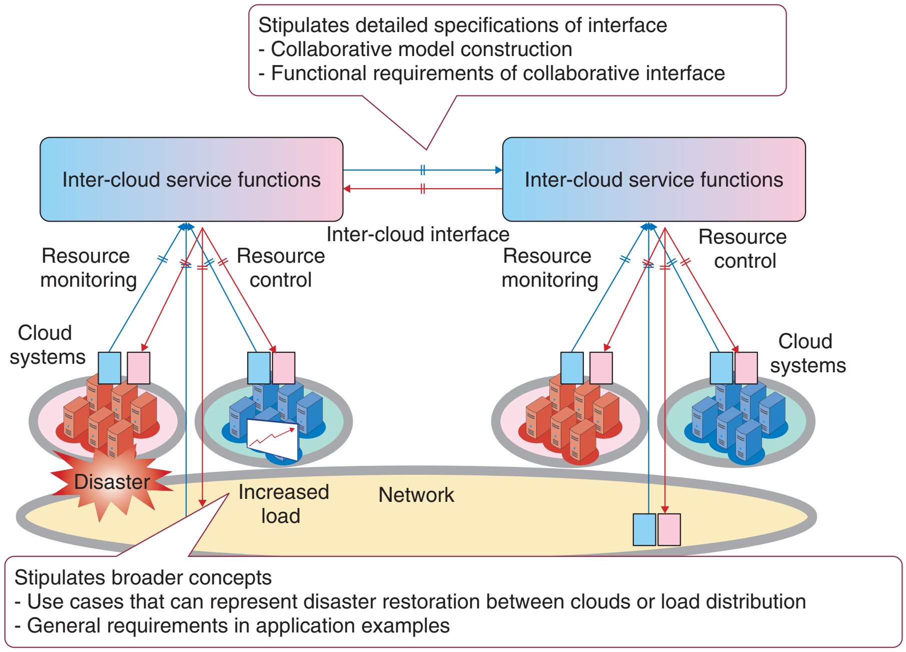

Fig. 2. Overview of inter-cloud techniques.

upper-level layers, have been proposed as new review items, and basic use cases for them are currently under review.

3. Standardization of inter-cloud techniques

Inter-cloud techniques have been proposed that achieve service/resource collaboration among multiple independent cloud systems to increase service/resource reliability in an economical manner, with the ultimate aim being to implement a highly reliable service infrastructure [3]. An overall view of inter-cloud techniques is shown in **Fig. 2**. These inter-cloud techniques flexibly accommodate computational resources such as virtual machines (VMs) between a number of cloud systems, and can be expected to restore services rapidly in the event of problems such as overloads or natural disasters that have a major effect on the provision of services. With inter-cloud techniques, it is necessary to assume interconnections between cloud systems and to stipulate a collaborative interface for accommodating resources, as common standard specifications. There are two main phases to these interface stipulations. It is first necessary to stipulate use cases and general requirements that can be represented comprehensively, such as disaster recovery and load distribution between clouds, as broader concepts. It is then necessary to design models for the collaboration among cloud systems and stipulate functional requirements for interfaces, as detailed specifications. Each of these aspects is described below.

3.1 Broader concepts

For the broader concepts, it is necessary to abstract use cases to make it possible to express the basic concepts of inter-cloud techniques and a wide variety of intended uses. As a basic concept, each cloud service provider (CSP), who is a business operator, provides services to a cloud service customer (CSC), but when a problem occurs with a resource that cannot be dealt with internally, the CSP negotiates with other business operators to make use of their unused resources. We are addressing problems such as server failure due to overload, system disruption due to a disaster, service stoppage due to business reasons, or increases in network lag due to changes in the location of users, as specific applications.

Use cases that abstract these concepts and address problems are shown in **Fig. 3(a)**. There are two ways to address problems: inside the cloud system or outside the cloud system, depending on the use case. When a VM or storage service within a cloud system can no longer be used because of an overload, disaster, or service stoppage, this corresponds to a problem within the system. To counter such problems,

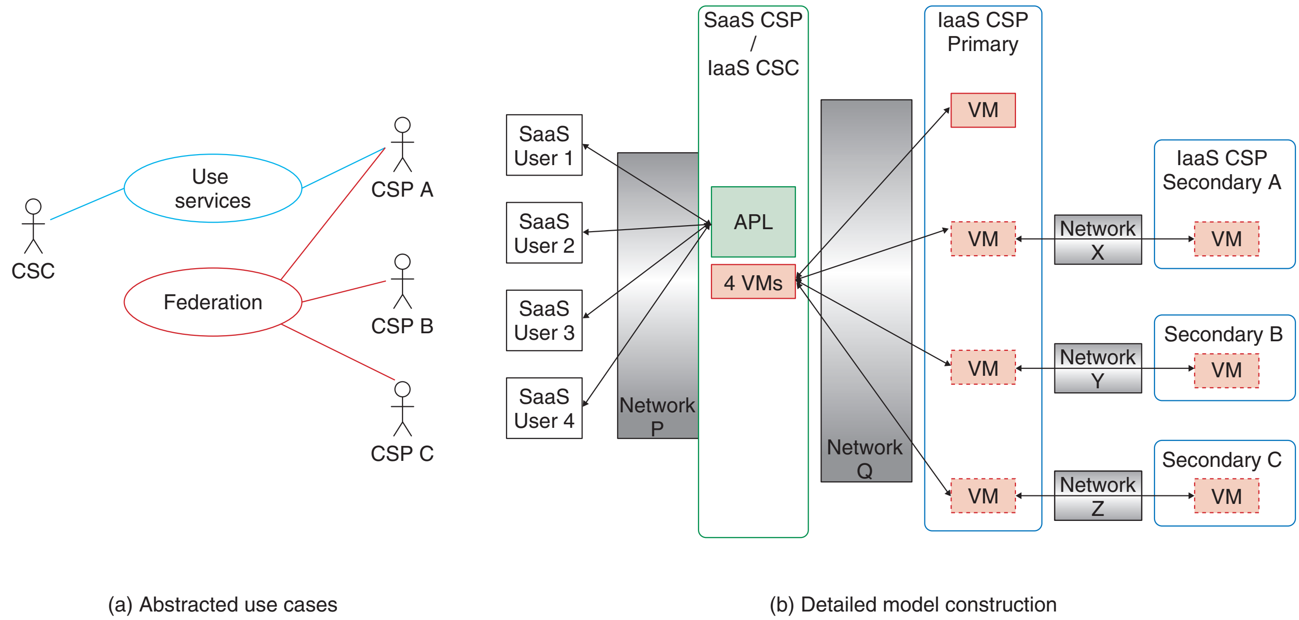

Fig. 3. Abstracted use cases and detailed model construction.

the CSP concerned collaborates with other CSPs and implements continued service usage for the CSC by migrating service functions to a VM or storage system that can be used. By contrast, when a user who has moved to another location, for example, during an overseas business trip, accesses services provided at the original location, network speeds and lag can cause bottlenecks. To counter that problem, the CSP collaborates with other CSPs and implements an effortless service usage for the CSC by following changes in the network environment of that user and migrating service functions to a VM and storage system of another CSP at the optimal location.

In order to implement such use cases, on-demand usage of resources between cloud systems, the distribution of load over a number of cloud systems, large-scale migration that enables simultaneous migration of the service functions of a large number of users, and adaptability to network changes have been proposed in ITU-T recommendation Y.3501 as general requirements in the broadest sense.

3.2 Detailed specifications

To discuss detailed specifications, it is necessary to construct a model of the collaboration between cloud systems that is required for actual service solutions and to embody the functions of a collaborative interface, based on the abstracted use cases.

In real-life businesses, there is a Business-to-Business-to-Consumer (B2B2C) model in which the CSP loans a VM to the CSC as IaaS, and the CSC develops and creates applications on the VM, then provides the applications as SaaS to end users. The construction of the cloud system collaboration model that reflects this B2B2C business model is shown in **Fig. 3(b)**. In this model, applications are constructed over a number of VMs of an IaaS CSP, and issues such as maintenance during normal operation and problem identification during failures are complex. In this case, a proposal has been made to divide roles into primary and secondary roles in order to simplify management, where the primary IaaS CSP has independent responsibility with respect to the IaaS CSCs, and the groups of VMs provided to IaaS CSCs are managed together. The CSP accommodates not only the VMs within its own system, but also the VMs of other secondary CSPs as necessary and provides them to the IaaS CSCs.

In the implementation of this collaboration, a number of Secondary IaaS CSPs are asked through a collaborative interface for computational resources such as VMs from the Primary IaaS CSP; once the optimal resources have been secured, they are provided to users. When they are no longer needed, it is necessary to notify the Secondary CSPs through the interface and release the resources. For that reason, requirements for interface functions such as the reservation, securing, and releasing of resources are being proposed.

4. Future expansion

As the cloud market grows, the completion of standardization specifications such as those for IaaS or NaaS (network as a service), which are currently under review, will have a huge impact on business in the future. In particular, the proposed Recommendation Y.ccic that stipulates inter-cloud frameworks is being reviewed with the aim of achieving consent within 2013. This is expected to simplify interconnections between business operators, contribute to disaster countermeasures, and help jump-start the market by standardizing and popularizing inter-cloud techniques.

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He received the M.S. degree in wireless network engineering from Osaka University in 2010 and joined NTT the same year. He has mainly been engaged in researching inter-cloud technology and cloud network security technology and has also worked on standardization activities of cloud computing in ITU-T and other related standardization organizations.

NTT DATA, Inc.

Imran Sayeed, Senior Vice President and Chief Technology Officer (CTO)
Vivek Mehra, Senior Vice President, Architecture & Innovation

Abstract

On January 1, 2012, NTT DATA, Inc. integrated several companies under its brand name, including Keane, Intelligroup, MISI Company, The Revere Group, and Vertex. This move is aimed at enhancing the global brand the company has established in the markets of the United States, Europe, and India. This article presents the business fields in which the company is involved and shows case studies for them.

1. Introduction

NTT DATA, Inc.'s present structure was formed by integrating multiple firms under its brand name. The first was Keane, which had been a wholly owned subsidiary of NTT DATA [1]. Then we integrated Intelligroup, MISI Company, The Revere Group, and Vertex. The largest of these firms was Keane, which had a business history of over 40 years. The amalgamation and reorganization of these firms was completed on January 1, 2012, but the official founding date of the restructured organization was April 1, the first day of the fiscal year in Japan.

These firms had all been focusing on different business fields. Specifically, Keane had specialized in application development and outsourcing, Intelligroup in supporting solutions from SAP AG and Oracle Corporation, MISI in staffing, The Revere Group in providing services to small-to-midsize firms, and Vertex in providing services mainly to Japan. Since none had been competing against each other, they are still able to use their respective strengths effectively. The complementary skills and locations of these companies give NTT DATA, Inc. a complete end-to-end consulting services catalog, with onsite/onshore, near-shore (Canada), and offshore global delivery capabilities (multiple delivery locations in India).

Geographically speaking, these firms have different strongholds. Within the United States, Keane's strongholds are the East and West Coasts and MISI's the Midwest. Vertex's home turf is Pune, India, and Keane also operates in India—in Delhi, Bangalore, Pune, and Chennai.

2. Business content

Our main lines of business include application development, business process outsourcing (BPO), testing, SAP* and Oracle packages, cloud services, and mobile computing services. Sales volume is highest for application development and BPO and SAP related areas. Sectors we specialize in include financial services, insurance, health care, civil service, and the commerce and manufacturing sectors. We present some case studies for these below.

* SAP is an acronym of a German software company that generally stands for Systems, Applications, and Products in Data Processing.

Fig. 1. Mobile system for recording taxi drivers' traffic violations.

2.1 Business process outsourcing (BPO)

Business process outsourcing is one of our strong points. Compared to other companies, in our outsourcing we have the advantages of being industry focused and multi-shore, and so are able to support a very large customer base. We focus on various industries and rely on platform automation to provide an extremely consistent experience for our clients. Our current industries include financial services and insurance, healthcare, travel & hospitality, as well as retail and foods.

2.2 SAP

Another area we are strong in is SAP, which is the global standard for backbone systems. Our SAP solutions have industry specific accelerators that improve the speed and quality of implementations, and we can offer them to a great many clients including major enterprises. For example, around 2003 we provided SAP solutions to Honeywell, a major American conglomerate involved in manufacturing and the aerospace industry. In February 2011 we announced the start of the *SAP Global One Team Initiative* [2] to apply the SAP related resources of the NTT DATA Group on a global scale. By sharing SAP know-how in this way, the group is contributing to the realization of "one step support". This includes a common methodology, standards, toolkits, and accelerators for a consistent delivery mechanism across the globe. Furthermore, in 2012 we developed a mobile system for the approximately 16,000 taxis in New York City (**Fig. 1**). The system involves inspectors making the rounds of the city and checking such things as whether the taxi drivers are violating traffic rules or whether their cabs have any broken lights. If they see any violations they input the taxi's license number and the nature of the violation into a mobile device. When they do so, they get the driver's history of violations and can use it to assess the appropriate fine for the latest violation. This has been evaluated as a major improvement over the old system of pulling the drivers over and giving them traffic tickets. Another feature of the system is that it can support multiple devices.

Fig. 2. Screenshot of gamification technology that helped NTT DATA, Inc. make the Information Week's list of the 500 most innovative corporate users of business technology.

2.3 AMO/Gamification

NTT DATA, Inc. is constantly striving to develop a wide range of solutions and technologies. As an example, two years ago we developed an application management outsourcing (AMO) solution called *DynAMO*. Our gamification technology that makes a game out of the teaching materials for our in-house training provided by e-learning has been covered by such publications as the Harvard Business Review [3], and helped us to make the Information Week's list of the 500 most innovative corporate users of business technology (**Fig. 2**).

Fig. 3. Customized example of Ignite Gamification Platform.

The *Ignite Gamification Platform* that provides these functions comprises open source software and links corporate activities, social media, and mobility to enable development of a great variety of games for business purposes. In our solution for the Girl Guides Victoria, an Australian organization similar to the Girl Scouts, we used the Ignite Platform to create a customized social media platform (**Fig. 3**). This was in response to their desire to have a social media platform that the girls and their leaders could safely learn on together.

2.4 Other

We also offer a high quality system development life cycle (SDLC), with design from testing to operation provided on demand. Our *Testing Catalyst* solution provides cloud services at low cost. Our agile software development model is easily applicable to the exacting standards of the U.S. federal government, and so we are able to provide its agencies and branches with high quality RAX software through NTT DATA Federal Services' hybrid software development process (**Fig. 4**). These and other efforts enable us to offer cloud services to an extremely large customer base. Within the context of these various efforts, it may be said that our distinctive character as a company makes us especially noticeable in the areas of SAP, outsourcing, and gamification.

3. Future prospects

The source of our ideas and drive lies both within and outside the company. Within the company we have organized the CTO (Chief Technology Officer) Executive Council that solicits ideas from all divisions in the firm, and since CTO Sayeed is also a Senior Lecturer at MIT (Massachusetts Institute of Technology), he can get ideas from others in that capacity as well. Ideas also come from the NTT DATA Group in Japan. As an example, we set up a work group for Japan, and exchanging opinions with its highly motivated members brings forth new proposals and suggestions.

At present, we have a translation problem facing us. Since the NTT DATA Group's intellectual property is in Japan, it takes considerable time to translate it for the benefit of U.S. clients. Furthermore, in the future we hope to concentrate on other areas, that is to say, to emphasize collaboration among Japan, Europe, and countries in the Asia-Pacific region. The *Global One Team* that NTT DATA organized in Japan in 2012 brings together participating group firms from the U.S., Europe, Japan, and the Asia-Pacific region; through such activities, we hope to solve the translation problem and enable the team to become a gateway to globalization. Among the technologies we retain, those we sincerely desire to introduce in Japan are our highly distinctive DynAMO and Testing Catalyst solutions.

4. Expectations of the NTT Group

I feel that a very favorable synergistic effect has been produced as a result of our coming into the NTT DATA Group. The extreme dedication the people in NTT DATA and the NTT Group show in their research and development (R&D) efforts in the areas of big data, cloud services, and mobile computing

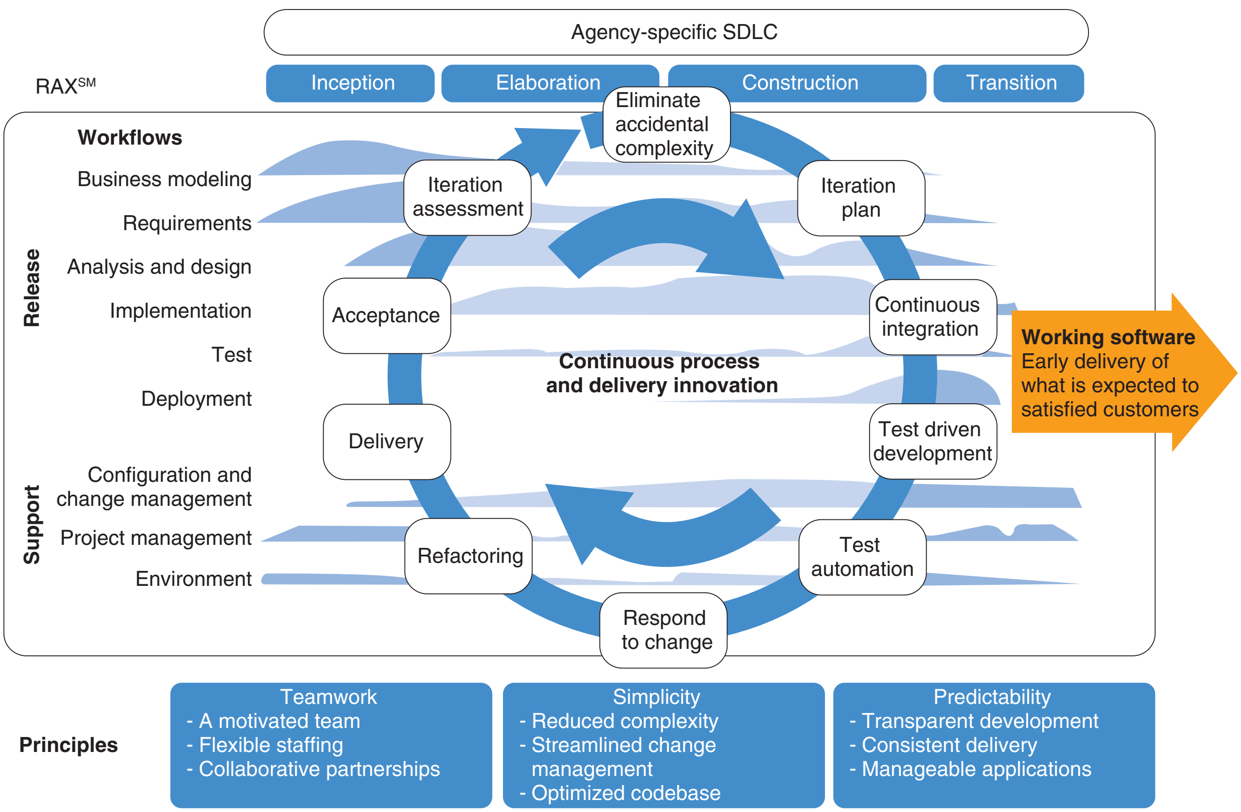

Fig. 4. RAX software development model.

services makes us realize the benefits to be gained by being able to effectively utilize these R&D resources.

Many of the people who are developing technology solutions at our facilities in the U.S. and India were posted there from NTT DATA in Japan. And since, as I mentioned, Vertex provides services mainly to Japan, a substantial number of its employees speak Japanese.

We have very close ties with NTT Holding Company in the fields of cloud services, mobile computing services, and security. Since the NTT Group has invested heavily in R&D, we can look forward to further expansion in these fields.

We are also an active participant in the new R&D center NTT Innovation Institute, Inc. (NTT I^3) established on April 1 this year. With the establishment of this organization we can anticipate further expansion of our R&D activities in the United States.

Looking over how things have gone since we came into the NTT DATA Group, I'm quite satisfied with the way this unique restructuring has enabled us to provide IT services. Our new tier-one global status will enable us to compete strongly to win larger deals in North America and will position us well as a younger, yet trusted provider comparable to other large onshore, as well as off-shore heritage firms. The U.S., Europe, and India all have their own different competitive environments, but with the global brand we've established in their markets I feel confident we can expect continuous growth in the future.

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Imran Sayeed

Senior Vice President and Chief Technology Officer, NTT DATA, Inc.

He came to NTT DATA through its acquisition of Keane, where he led a 7,000-person technology consulting organization. Before that, he founded netNumina, a boutique technology strategy and consulting firm that he grew from a 15-person startup to one of Computerworld's Top 100 emerging companies and Inc 500's fastest growing businesses. Previously, he was a founder of Open Environment, where he grew the company from a 10-person startup to an initial public offering (IPO). He is also part of the Entrepreneurship and Innovation faculty at the MIT Sloan School of Management. He holds a patent on Internet technology he jointly developed with Citibank, and he was named by Computerworld as one of the Premier 100 IT Leaders for 2013. He attended Brown University, where he majored in engineering, and Harvard University, where he did post-graduate work in business, marketing, and product development.

Vivek Mehra

Senior Vice President, Leader of Architecture & Development and the Solutions & Innovation group, NTT DATA, Inc.

He is a member of the NTT DATA CTO Council and has over 20 years of experience in technology innovation, IT services marketing, business development, IT strategy, systems integration, and data architecture. He has consulted for large corporations in multiple industries including financial services, insurance, healthcare, pharmaceuticals, automotive, and government. Previously at Keane, he was head of Global Financial Services and Insurance. Earlier, he served in business and IT leadership positions at Wipro/Nervewire, Pioneer Investments, State Street Global Advisors, and Cambridge Technology Partners, leading teams in Ireland, Germany, India, the UK, and the USA. He received the M.S. degrees in physics and computer science from the University of Massachusetts and the University of Georgia respectively; a Graduate Certificate in Administration & Management from Harvard University, and executive management certificates from MIT's Sloan School of Management.