

## R&D Spirits

### Toward “Triangle Services” Drawing on Group Synergy

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NTT’s Comprehensive Commercialization Functions provide planning and coordination support for commercializing the results of NTT R&D programs. Within this system, the Service Platform Team works to achieve network-wide services in the broadband/ubiquitous era. We asked Dr. Takao Kakizaki, R&D Chief Executive Producer and head of this team, to tell us about the kinds of businesses that are now taking form and those slated for the near future.

#### Laying the groundwork for six categories of service platforms

—Dr. Kakizaki, what are the main themes of your current work?

Well, to begin with, we are commercializing service platforms making extensive use of NTT R&D results (Fig. 1). We know that a wide variety of services will emerge in the optical broadband and ubiquitous society of the future. Yet these services will only be effective if a secure and easy-to-use service environment can be provided for both end users and service providers. Our aim is to provide such an environment. Here, instead of simply commercializing individual R&D results, we plan to exploit the synergy of the entire NTT group in up-and-coming business domains to develop service platforms in six categories. These are content aggregations, senior-citizen services, radio frequency identification (RFID), broadcasting/communications convergence, broadband-mobile services, and home network services. These are what I would call our main themes at present. In addition, I have personally taken on a project in the manufacturing industry with a colleague of mine to develop network support services for small and medium enterprises such as the small-scale factories in Tokyo’s Ota ward.

—Could you give us some specifics on these commercialization themes?

In content aggregations, we are developing content businesses based on a totally new framework starting with music-search services. In the second category of senior-citizen services, we are developing care-prevention services based on video communications. This work originates in the knowledge that society is aging rapidly and in NTT’s desire to contribute in some way to solving the resulting problems. It is also being pursued with the aim of uncovering next-generation latent needs. As for RFID, we are developing platforms using wireless IC tags for solution businesses directed mainly at the distribution and manufacturing industries. Next, in the fourth category of broadcasting/communications convergence, we aim to create links between broadcast stations and content holders to develop content-distribution services over NTT’s optical broadband networks. I’d like to emphasize that our work here is not to create content but to provide a metadata distribution platform to efficiently drive the distribution of content. Then, in broadband-mobile services, or “fixed/mobile convergence,” we would like to provide services that connect the broadband and mobile worlds at the platform level. This will enable a user to shop via broadband-based services and settle the transaction instantly all by cell phone. Finally, our desire through home net-

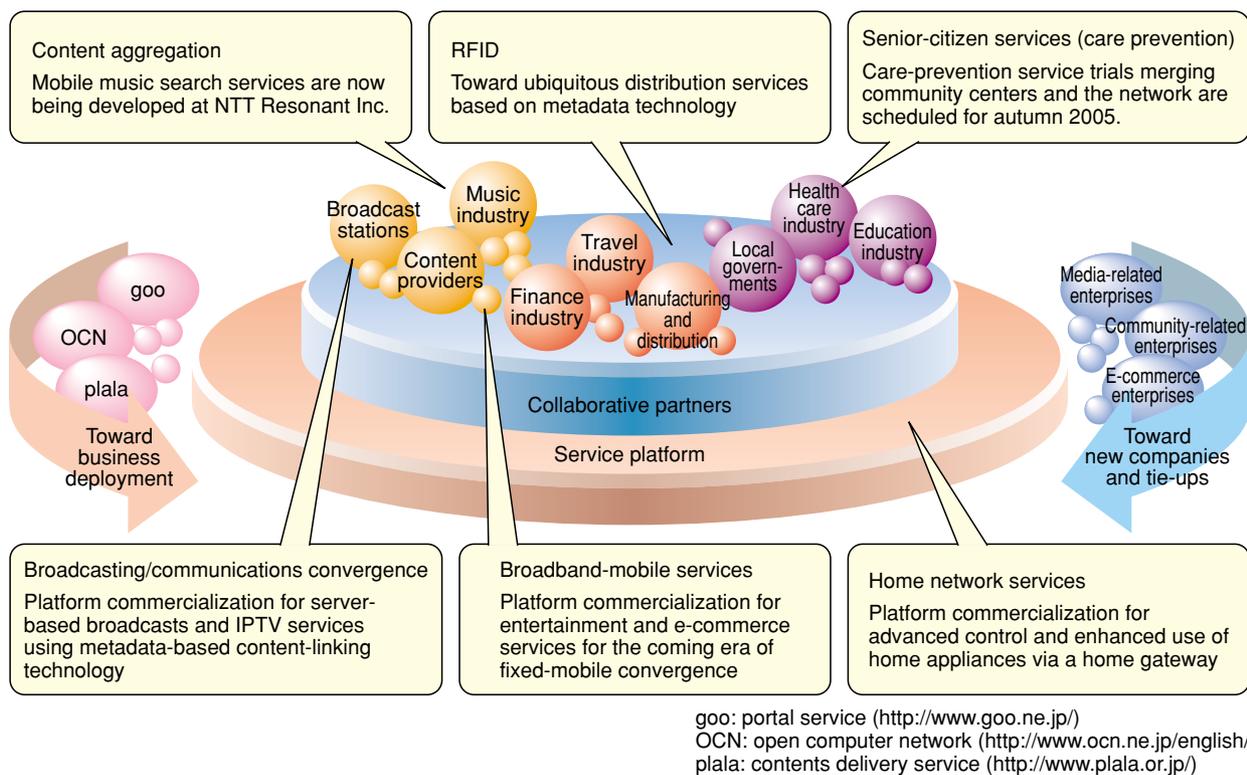


Fig. 1. Commercialization of the service platform.

work services is to usher in a new lifestyle for all users by enabling them to control various appliances in their home via broadband and mobile networks. Here, it is essential that users feel comfortable and secure with such home services, and we intend to commercialize services that attach importance to the proper use of home gateways or hubs that collect information.

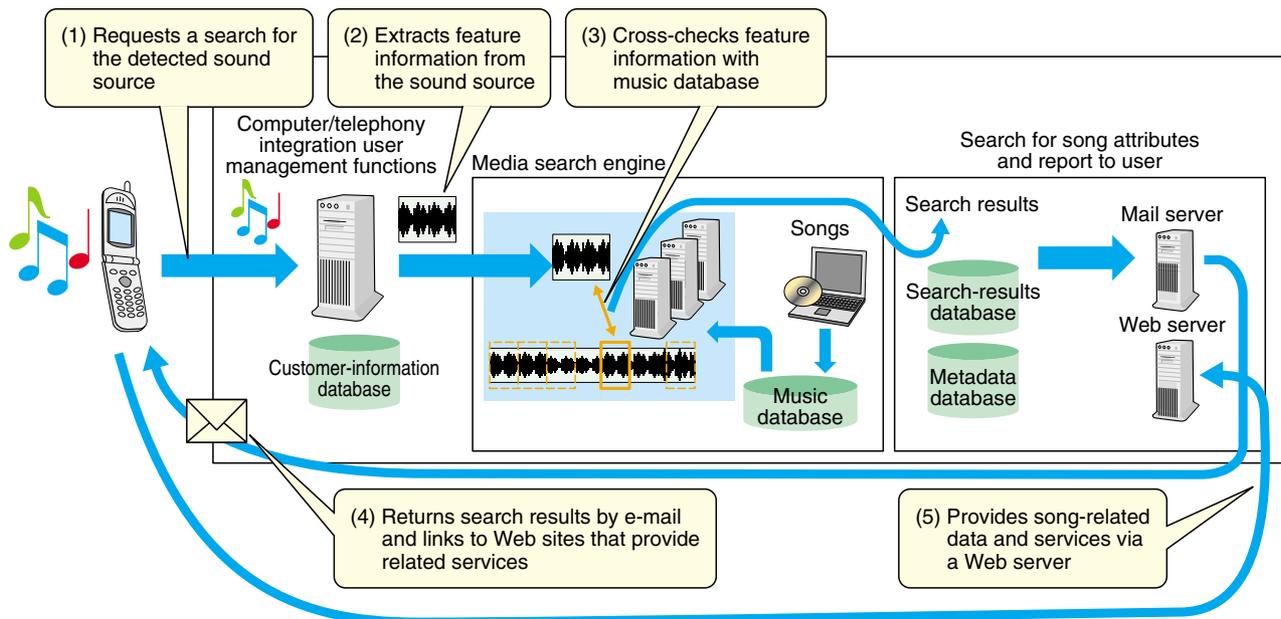
—Are any services already in use?

Yes. Let me give you some examples. In December 2004, the “Ate!Melo” service was launched on the Japanese search engine “goo” [1]. This service enables cell phone users to learn the title and artist of a song or musical piece that is currently playing at home or somewhere outside by simply holding the phone next to the sound source for about 15 seconds. Based on that audio data, a server then searches a music database and returns information about the song to the user’s cell phone via e-mail. Of technical significance here is that the service stores and searches not for the music itself but for the “fingerprint”<sup>\*</sup> of that music (Fig. 2). From a business point of view, the rights associated with such “fingerprints” in providing this service are also a matter of deep interest sep-

arate from any copyright issues associated with the songs themselves. In this sense, we do not regard this service as simply a way of finding the name and artist of a particular song. We also envision it as being a gateway to various types of e-commerce. For example, if a user of this service likes the song in question, why not enable him or her user to download it on the spot or view related concert information and order tickets? But here, we must deal with issues that cannot be solved solely by technology, such as musical copyrights not directly related to the search service. We would therefore like to construct a scheme for cooperating with song-writer and composer organizations, for example.

Next, in senior-citizen services, a video-based content-delivery service designed to prevent the need for

\* fingerprint: Audio fingerprint technology can be used to perform music matching, a kind of music fingerprinting. When you call in with a song to be matched, the system creates a “fingerprint” of the sound coming in from your mobile phone and then searches through the fingerprint database for a match. The music fingerprinting system enables users to automatically identify music by comparing unique fingerprints extracted from the music with fingerprints in a specially compiled database. The system runs on a central server and comprises advanced fingerprint extraction and search algorithms plus a database containing audio fingerprints and metadata (identification data).



Geared to a mass market of several hundred thousand consumers, this system uses a mobile-telephone connection to detect the sound source of a song being played close to the user and searches a huge music database for that song, returning results and links to Web-related services by e-mail. NTT media search technology enables high-speed comparison of music "fingerprints."

Fig. 2. Mobile music search system.

nursing care of the elderly is scheduled to begin this fall. This service is still in the trial stage, however, and the plan is to limit its rollout to specific regions such as Tokyo, Shizuoka, and Nagoya for the time being. Needless to say, providing nursing care for the elderly has become a major problem in Japan. To help alleviate this need, a plan has been established to revise Japan's Long-Term Care Insurance from 2006 with the idea of emphasizing care prevention and reducing as much as possible the number of nursing-care recipients. At present, however, the number of care-prevention counselors is small. Our proposed service originated from the idea that broadband communications might provide a solution here. Specifically, it will introduce a network and video-communication system in local government facilities and homes of the elderly to periodically provide care-prevention programs such as physical exercises. The service will be able to provide a variety of programs, and since it will be bidirectional, elderly users will also be able to have health consultations with care-giving experts (Fig. 3). Though the mechanism behind this system is relatively simple, the plan is for NTT East, NTT West, and NTT Communications to provide system support and for NTT TelWel East and TelWel West, which are already in the care-giving business,

to handle actual base operations and management. In short, we expect group synergy to play a big role in the provision of these senior-citizen services. There is considerable community interest in our proposed video-based service for the elderly and we are receiving many inquiries in response to our press releases.

—Could you tell us something about your work in network support services for small and medium companies?

Yes. First, let me mention that I've been involved with this work since the 1980s when I was researching and developing intelligent robot systems. Although Japan is a high-tech country, it is surprising how small and medium companies, which provide much support for Japanese industry, have been left behind in the IT boom. Tokyo's Ota ward, for example, is the home of small and medium manufacturers that include leading enterprises that deliver products to NASA and other major procurers. However, many of the small-scale factories employing less than a dozen people are still using faxes and floppy disks to exchange drawings. This adherence to past technology makes it difficult for a company to be active at the forefront regardless of its level of know-how. The NTT Group thought that

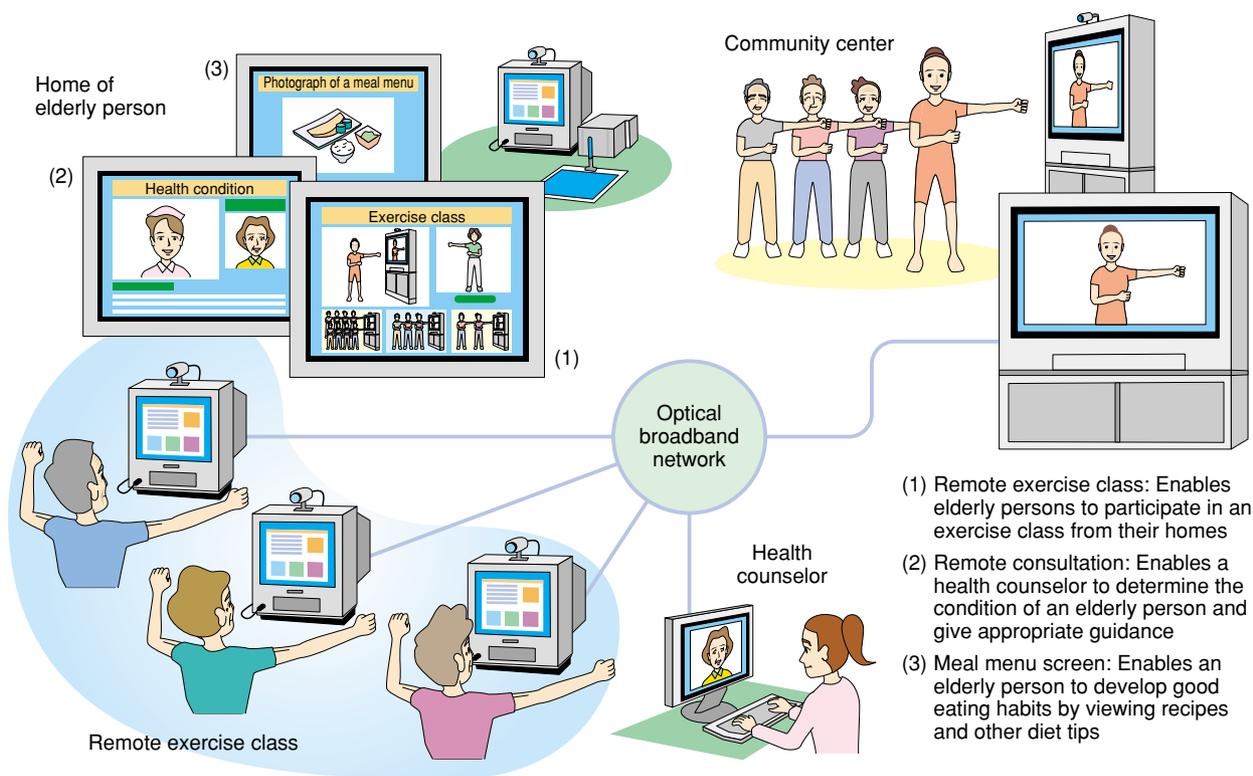


Fig. 3. Concept of a care prevention system.

there must be a way to rectify this situation. After working with industry people and passing through a trial-and-error period, we developed a service that provides a production management system combined with equipment leasing in the form of an application service provider (ASP) that is easy for small and medium companies to deploy. There has also been serious talk about using a videoconferencing system to facilitate information sharing between remote factories. Though I have been pursuing this work independently, it has taken on a form similar to our commercialization work, and I expect the development of such systems to eventually become a formal project. Small and medium businesses in Japan constitute a treasure house of technology, and this theme of stimulating their communication infrastructure, though perhaps not as grand as other national projects, is an extremely important issue for Japan.

### Forming alliances with non-technical experts: The key to success

—What are some key issues in projects that are now underway?

The examples that I have presented to you may

appear to be services having no direct relationship to each other. But they have two key elements in common. One is that they all use broadband networks. The other, which I feel is very significant, is that they all have a non-technical aspect. In the music-search service, for example, we are working together with song writers and composers to commercialize our technology; in the senior-citizen services, we are working with organizations for doctors and professionals that conduct research on care prevention. I believe that establishing connections with the management of related enterprises and groups will be an important factor in the success of our service platforms. Since user reaction to our new services is unknown at this time, we are still in the process of determining what direction to take while developing these services. Our work therefore presents us with all kinds of challenges. Whether or not we succeed in the end will depend on actual results, but we think it best to get a number of projects moving.

—How do you see the work of your commercialization team developing in the future?

At present, we are developing several categories of service platforms as I explained earlier, but in the

future, all of the services I have been talking about should be integrated on a single platform. For example, the video-communication system that we plan to provide for senior-citizen services could be installed in ordinary households and be connected to home network services. In particular, it should be possible to provide remote monitoring of household conditions in the case of elderly persons living by themselves. Although “Mimamori” services (remote monitoring services for elderly persons) are available in Japan to provide unilateral monitoring of the activities of elderly persons, by automatically reporting when they use a tea-server for example, we believe it is important to respect the privacy and lifestyle of the elderly people. Remote-control functions for gas and electricity may also be necessary, and they could be achieved through broadband-mobile services. Of course, a lot more testing and evaluation is needed to make such intricate services practical, and to this end, it is essential that we form partnerships with enterprises outside the NTT Group. While we are not yet at that stage, I think that the proper direction for us to take in this regard will reveal itself in time.

—*Dr. Kakizaki, what research theme interests you the most?*

Right now, I would say information distribution centered about video communications. At present, the video carried by broadband networks consists mostly of television programs and movies. But I think the time is not far off when companies and local governments will be exchanging information by broadband means as a matter of course. This is why I am interested in ways of making use of video communications for business purposes. In fact, there is already a securities firm that has set up a studio on company premises to disseminate information by daily live broadcasts, and there is an airline company that is providing more than 500 items of content by broadband video. This information may flow over dedicated channels, via the Internet, or even by satellite broadcasts, and there is no reason to believe that it will not flow via cell phones in the future. In a similar way, we ourselves are setting up an environment with our own video channels for sharing content. I believe this trend will only accelerate in the years to come and even expand to the individual level. But for that to happen, we will need to construct a service platform that is secure and easy to use from both the corporate and individual viewpoints. I am personally interested in creating such a system.

## Focusing on areas ignored by others and developing “sleeping” assets

—*What research themes have you personally worked on up to now?*

During my university days, I researched fluid-control devices. Then, after entering NTT, I was first involved in the development of a head-positioning mechanism for large-capacity magnetic disks. In 1987, I had the opportunity to spend one year at MIT as a guest researcher working on the modeling of robot dynamics. On returning to Japan, I was assigned to the research and development of genuine intelligent robots. It was here that I worked on the development of a high-speed, path-tracking robot system with optical sensors for automobile production lines that eventually evolved into a robotic welding system.

In 1990, I entered NTT Human Interface Laboratories and undertook the development of a wearable computer system for on-site use in the production industry as part of NTT’s multimedia research program. At that time, there was much research on multimedia for entertainment purposes especially in the form of music and video. It occurred to me that multimedia might prove extremely useful on the production floor as well, so based on the concept of “field multimedia,” I began work on the development of a hands-free wearable computer system that could be used in the installation of communication facilities. Unfortunately, this system was ahead of its time and never reached a practical stage.

Next, in 1999, I became manager of the business innovation project at NTT Cyber Solutions Laboratories. The role I played here was quite similar to my present work as a chief executive producer. In particular, I promoted R&D results in totally new ways such as by establishing an “open room” for introducing our technology to companies and issuing the laboratories’ first R&D e-mail newsletter. I was also instrumental in launching a corporate broadband broadcasting system for a major airline as a new trial of optical network services. Finally, after obtaining some business experience at NTT IT, I took on my present position in August of last year.

—*What have your experiences in research prompted you to pursue?*

I like to use broadband technology in a new field that others have ignored. Or to put it another way, I have a

single-minded desire to develop “sleeping” assets that no one has thought of in a field that I can excel in. But with that as a starting point, many challenges have come my way, and it has become clear to me that this kind of pursuit is never going to be simple. Nevertheless, I don’t like to quit something once I have started, and in a somewhat masochistic way, I continued with my R&D efforts here. At long last, high-speed connection services like ADSL and B-FLET’S have provided me with a favorable wind and I feel that some of my work is beginning to materialize.

*—Have you been involved in any overseas activities? What kind of response has your research received?*

Well, I’ve been away from actual research for a while, but my last presentation at an international conference was on wearable computing, and I must say it was well received. But unfortunately, I cannot say that NTT Laboratories was well known to the audience. Of course, everyone knew NTT as Japan’s flagship carrier, but no one seemed to know that NTT Laboratories was involved in a wide range of research. When I presented our far-reaching R&D results on wearable computing and peripheral multimedia and communication systems, many people expressed surprise saying things like “NTT is doing things like this?” This response generated mixed feelings in me. On the one hand, it reminded me of NTT’s comprehensive power, and on the other hand, it made me realize that NTT Laboratories was not well known despite its great research prowess. I became keenly aware that NTT must strive to make itself better known to the world at large.

*—Has there been any collaboration with overseas research institutions or companies?*

No, not really, because most of the development themes that we have been working on so far have been of a domestic nature. However, I think this is about to change. For example, there is talk of expanding our content-aggregation music-search service in Asia. And since there is already a global market for home appliances, it is imperative that we began cooperating with international standardization organizations and overseas carriers on the development of home network services. At any rate, expanding into international markets means that both collaboration and competition are bound to increase, and we can see many challenges arising.

## Using broadband to make “hidden” knowledge a shared asset

*—Dr. Kakizaki, could you tell us something about your future aspirations?*

First, in terms of content aggregations, I would like to give birth to services covering the entire NTT Group as soon as possible. I would also like to start expanding overseas in this area in the near future. Next, with regard to senior-citizen services, I hope that we can take our proposed service from a trial stage to a genuine service sometime in this fiscal year. And as for broadband-mobile services, I would like to launch, as soon as possible, a service that draws upon the synergy generated by the optical services of NTT East, NTT West, and NTT Communications and the mobile services of NTT DoCoMo. For the medium term, our goal in this area is to set up “triangle services” between optical broadband, mobile communication, and a service portal. The idea here is to provide seamless services combining optics, mobile communication, and a portal that accommodate differences in the way that information flows and provide a common platform for all kinds of work. Of course, the companies involved will have to make some adjustments for this to work, and this project is not something that I can accomplish by myself. But I think that all of us together should be able to come up with a robust framework for triangle services.

*—What is your ultimate desire as an engineer or researcher/developer?*

That would be to create a mechanism that can open up the knowledge possessed by various kinds of people to everyone by broadband means. There are many people throughout the world that possess valuable knowledge, but there are few people that can convey their knowledge through television, writing, or other popular media. Most people simply do not have a forum for presenting their knowledge. I therefore think that broadband technologies, if used in the right way, should make it possible for anyone to disseminate their knowledge to the world, and that the use of feedback should make the process even more efficient. I would like to help create such a mechanism. Although I am still at the conceptual stage and have yet to formulate a specific methodology, I know that the most logical approach will come to me if I develop a clear image of this service. I can already sense that this will involve many problems and difficulties,

but I am ready to take up this challenge with the help of a great network of colleagues that I have access to in my daily work.

—*What is it like working at NTT Laboratories in your personal opinion?*

First, NTT Laboratories taught me how to devote myself to my work. I wasn't a very serious student at school, but in the first few years after entering NTT Laboratories, I studied several times as much as I had ever studied during my school days. In fact, whenever I could not concentrate at work for whatever reason, I would take a day off and simply work in my room at the dormitory. Just immersing myself in this way helped me to realize what a joy learning can be.

Second, NTT Laboratories is a place where many people serve as role models for other researchers. It is a place where a surprisingly large number of brilliant people are gathered. I myself learned much from observing these people. Whenever I have people working under me, I tell them "Find a good mentor fast and emulate whatever they do!" Emulating even small things like the mind-set of that person, or the way that he or she takes notes or makes presentations, should improve your own self-confidence and help you to develop your own style in time. This, I believe, is one of the great traditions at NTT Laboratories.

—*Dr. Kakizaki, could you leave us with a message for young researchers?*

I would be happy to. Though this may sound a bit trite, I want you to make time to devote yourself to only one thing, to think only about that subject. Whether that be for only one hour or ten days at a time, you will one day feel the joy of having a sudden flash of understanding. And once you feel that, you will make a habit of immersing yourself in something. Even if it concerns only a trivial matter, your self-confidence will grow. In short, it's very important that you try devoting yourself completely to one thing, whether it's something that you like or detest.

In addition, I would like you to go abroad as much as possible. Performing research overseas is a kind of do-or-die situation. You must take up the challenge of learning new things in an unfamiliar environment, and you will find that you have no choice but to go for it. Simply put, an unfamiliar environment brings with it many new stimuli that can actually act as a breath of fresh air in your life. You should therefore take advantage of any chance you might have of working overseas, and if no opportunity is provided, you should take it upon yourself to create that possibility in some way. You will always benefit from overseas experience!

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## Reference

- [1] <http://mobile.goo.ne.jp/melody/> (in Japanese).

## Interviewee profile

### ■ Career highlights

Takao Kakizaki received the D.Eng. degree from the Graduate School of Engineering of Tohoku University in 1979 and entered Nippon Telegraph and Telephone Public Corporation the same year. He has performed research at NTT Musashino Electrical Communication Laboratory and NTT Human Interface Laboratories and has held various key positions including head of the planning department at NTT Cyber Solutions Laboratories and company director and manager of the video communications division at NTT IT Corporation.

During his time at these laboratories, he worked in the development of large-capacity, high-speed magnetic disk storage systems, research on mechanism modeling methods incorporating elasticity, development of a high-speed path-tracking robot system with optical sensors for automobile production lines, R&D of “field multimedia” and remote maintenance for manufacturing areas applicable to wearable computers, development of new businesses using the broadband Internet, and promotion of the JALTV project, which can be called Japan’s first corporate broadband broadcasting system.

He is currently heading the commercialization of services and creation of new businesses based on R&D results in info-communication technology. His aim is to create added value in a wide range of fields from the corporate to the consumer with an emphasis on broadband and ubiquitous functions. He is specifically engaged in the development and commercialization of broadband-mobile services, life-support ser-

vices employing video communications, content distribution using metadata, and personalized e-commerce services. He is also working on an extensive next-generation vision that includes remote manufacturing and the means of realizing that vision.

### ■ Major academic society functions

- Specialist Investigator, Science and Technology Specialist Network, National Institute of Science and Technology Policy, Ministry of Education, Culture, Sports, Science and Technology
- Trustee, Manufacturing Science and Technology Center
- Chairman, FA Open Systems Promotion Forum (FAOP)
- Adjunct instructor, Tokyo University of Agriculture and Technology; adjunct instructor, Akita University
- Director, Robotics Society of Japan; member of various academic societies
- Fellow, Japan Society of Mechanical Engineers
- Guest researcher in the Mechanical Engineering Department, Massachusetts Institute of Technology (MIT), 1987-1988
- Participant, Strategic Marketing Course, Graduate School of Business, University of Chicago (Chicago GSB), 1997

### ■ Publications (as coauthor)

“Design Technology of Ultra-precise Systems,” “Integrated CAD/CAM Systems,” “Wearable Information Devices,” and “21st Century Mobile and Wearable Devices” (all in Japanese) plus various magazine articles, technical papers, and domestic and international patents.