Best Engine

Vol. 13

On the Occasion of its 50th Anniversary, Engineers Speak Openly About CTC's Present and Future

ITOCHU Techno-Solutions Corporation

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Vol. 13

Cover illustration by
Miki Mohri

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Getting a Bird's-Eye View

We recently installed a Sphere digital globe in a common area of our office. It is huge, with a diameter of 128 cm, and shows, dynamically and in real-time, the various phenomena and environmental changes occurring on Earth. Based on scientific knowledge, statistics, and other data, it displays what is happening on Earth—such as in its weather, ocean currents and temperatures, and continental drift. By giving one's full attention to this digital globe, we can get a bird's-eye understanding of the challenges being faced by the whole world, such as global warming, abnormal climate, and the issue of marine plastic waste. With CTC having marked the 50th anniversary of its founding this year, we saw this as a good opportunity for us to review our role in society and think about sustainability, so, we decided to install the digital globe.

To achieve a sustainable society, it has become important for us to be able to take a bird's-eye view and understand matters from a global perspective. National borders are irrelevant when it comes to environmental issues. What can CTC do by studying its strengths and resources, and considering them in relation to the situation in the world? I would like us to be thinking of our next moves—about carbon neutrality, for example, an issue that should be addressed by the whole world. Since the 1990s, CTC has been focusing on simulation technology that enables the visualization of the global environment, including the weather. I feel that green transformation (GX), which promotes the utilization of renewable energy and new urban design, is truly an area in which we can play a role.

Now that we have marked 50 years as a company, we will aim to become version 5.0 of CTC.

In version 1.0, our business expanded with systems shifting to open architectures. Version 2.0 drove the spread of Internet technology. Our skills were polished in version 3.0, with a focus on mobile services. In the current version, 4.0, CTC combines technologies, such as cloud computing and artificial intelligence (AI), to contribute to the digital transformation (DX) of companies and society. We will now become a CTC that goes beyond this.

My desire is that by taking a bird's-eye view of what is happening in the world and pursuing optimal solutions for various issues and challenges, we will be a company that will be of use to humanity and the Earth.

Ichiro Tsuge

President and CEO
ITOCHU-Techno Solutions Corporation

Special
Feature

On the Occasion of its 50th Anniversary, Engineers Speak Openly About CTC's Present and Future

CTC celebrated its 50th anniversary this year. On this milestone occasion, we invited five engineers in the company to come together and discuss where CTC currently stands and where it is headed in the future. The roundtable discussion features the five CTC employees who appeared in the ad "Mezase, mahotsukai" (make magic), the fifth in a series of ads in the Nikkei Newspaper commemorating the company's 50th anniversary.

What are CTC's strengths? What challenges does it face?

How can CTC achieve sustainable growth?

With Senior Fellow Hidetoshi Satomi as facilitator, the group of five freely offered their views on these questions.

Coverage and text by Yuki Kondo

Special

Roundtable
Discussion

CTC Engineers ✕ CTC Hidetoshi Satomi

Senior Fellow

Naohiro Fujie
General Manager and Executive Engineer,
Nishi-Nihon Business Development Department
Nishi-Nihon Engineering Administration Division
Regional & Social Infrastructure Group

Tsugumi Watanabe
Expert Engineer
CTO Office/Advanced IT Strategy Division

Saeko Kubota
General Manager, Institute of Open Innovation Research "MIRAI"
Business Innovation & Digital Transformation Group

Aiko Matsumura
Systems Engineering Department No.3
Telecommunication Division No.2
Telecommunication Group

Yuki Izumi
Science Engineering Department No.2
Science & Engineering Systems Division
Enterprise Group

Satomi: CTC celebrates its 50th anniversary this year, and with the COVID-19 pandemic behind us, we now stand at the precipice of change. We are approaching a critical juncture where we must be conscious of DC5—Digital transformation, the Cloud, and 5G—as we take on new challenges. Against this background, we have asked you to come together and speak freely as engineers working in various fields about CTC's challenges and prospects. Let us begin with some self-introductions.

Kubota: I joined CTC right out of college and began working as a database engineer. After gaining some experience in that field, I moved on to matters related to information systems,

Facilitator

Hidetoshi Satomi

General Manager of the CTO Office Advanced IT Strategy Division, Advisory Member, and Senior Fellow

Joined ITOCHU Techno-Solutions in 1988. Involved in the development and construction of large-scale systems for data communication networks from the early days of the mobile Internet. Contributed to the widespread adoption and expansion of Internet use in Japan. Has been supporting CTC's technology strategies and innovation as fellow. In current position since April 2022.

namely business intelligence and data warehouses. I've basically been working in data analysis the whole time. I joined the AI Business Promotion Department four years ago and served as the general manager for three years. This year I became the general manager of the Institute of Open Innovation Research "MIRAI" (hereafter referred to as MIRAI).

Matsumura: This is my 15th year at the company, and I have worked on network-related issues the entire time. In particular, I have been doing work for carriers for a long time, as you might guess from hearing that I am in the Telecommunication Group. Right now, I am mainly involved in large-scale systems that include everything from infrastructure to applications for carriers, as well as networks and as a back-up PM (project manager).

Izumi: I am in the Science & Engineering Systems Division, mainly working on numerical analysis using the finite element method. My particular focus at the moment is on simulations of nuclear facilities in the event of an earthquake. At the same time, I am also doing research on quantum algorithms.

Fujie: I work in the Nishi-Nihon Business Development Department, where we mainly develop and sell proprietary cloud-based applications. I oversee an IDaaS (identity-as-a-service, or a cloud-based ID management service) package called SELMID. I was a mid-career hire at CTC and have now been with the company for over 20 years. After working in SI for so long, I felt like I really wanted to do something new. I think that's what led me to these packages that we—by ourselves—are making and selling.

Watanabe: I joined CTC in 2001 and worked as a product engineer on infrastructure products such as servers and storage for a long time. After that, I was involved in planning new businesses in the Innovation Promotion Division, and then went to Malaysia on an assignment for about three years as part of a global business unit. In Malaysia, I worked on setting up our own cloud services, as well as proposing and planning cloud services such as AWS and Azure to our customers. I'm now at the CTO Office Advanced IT Strategy

Division, researching the latest technology trends and internally disseminating the information.

<div style="text-align:center">

Creating an Environment Where People Can Take the Initiative and Challenge Themselves

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Satomi: I am sure that each of you has experienced many things, good and bad, in your work as engineers at CTC. I would like you to give me some tips on how to make CTC a better company. Give me your honest opinions on the challenges CTC faces, what could be changed, and what strengths CTC should leverage in the future.

Kubota: Lately I've felt that it would be good if we had an atmosphere that encouraged people to take on challenges on their own initiative. I believe that originally, vendors saw CTC as a company with a lot of engineers who were more knowledgeable than the vendors, because we did our own development. However, in recent years, with the growing abundance and variety of IT features taking the form of services, as well as the increasing division of labor, there seem to be fewer opportunities to gain development experience. When taking on a new challenge, it is difficult to take a step forward unless you can do some trial and error yourself. In order to put the slogan of "disruptive innovation" into practice, we at MIRAI would like to start by changing this environment. I would like to strengthen the atmosphere that encourages people to work with their own hands and think for themselves as they make use of the new technologies that are continually emerging to solve new problems.

Fujie: When I joined the company, we still had a strong culture of developing things in-house. I was told that a true CTC engineer should be writing the source code him- or herself. Perhaps it was in the early 2000s that the company gradually grew, the number of engineers increased, and the ability to manage projects took on more importance as the

company began receiving contracts for large SI projects. Against this backdrop, I feel that the company's emphasis shifted to management, leading to fewer opportunities for in-house development. I was in Osaka, where the atmosphere was a bit different from Tokyo, and we continued to develop. Of all the general managers at CTC, I've probably written the most code.

Saeko Kubota

General Manager, Institute of Open Innovation Research "MIRAI"
Business Innovation & Digital Transformation Group

Having worked in the analytical business, from databases to data warehousing and business intelligence (BI), Ms. Kubota has been working on the business of artificial intelligence (AI) in recent years. In current position since April 2022.

Satomi: It is true that the atmosphere we used to have, where people created things with their own hands, has changed. While there are many factors involved, such as CTC's policies and the changing times, I personally believe it is important to have an atmosphere in which people take the initiative to create new things on their own. Mr. Izumi, as someone who still does his own programming, how do you feel about this point?

Naohiro Fujie

General Manager and Executive Engineer,
Nishi-Nihon Business Development Department
Nishi-Nihon Engineering Administration Division
Regional & Social Infrastructure Group

Experienced in systems development in a broad range of areas. Currently oversees new business related to digital identity, with a focus on cloud-based API development.

Izumi: My main work is in numerical analysis, so I do my own programming on a daily basis. I do feel that it is important for engineers to have this sense of creating something by themselves. Regarding how this relates to my current work, I write code to make the work more efficient by automating some of it. Many of us in the Science & Engineering Systems Division are highly specialized. If we could streamline our work and create an environment in which we can focus entirely on our respective areas of expertise, then I feel like we could grow even more. In the quantum field as well, I think it will become increasingly important to have people who not only have a solid understanding of the theory but can also write programs.

Matsumura: I have always worked on networks and developed my expertise in that area, but with the shift to cloud computing, on-premise infrastructure projects are becoming less and less common. I therefore felt the need to learn new fields on my own, and this year I am participating in training on the ID-related system that Mr. Fujie mentioned earlier. At the same time, it is also important to pass on the knowledge we already have to the next generation. Also for this reason, I would like to maintain my current expertise while taking on new challenges and connecting with all sorts of people.

Watanabe: We were just talking about the early 2000s, and that's right about when I joined CTC. Since then, I have spent most of my time at CTC in fields related to infrastructure. When I was in the Innovation Promotion Division, I thought up business models in my own way, developed the necessary applications, and programmed robots to run them. I learned a lot by being able to get involved in so many different tasks. Based on that experience I have come to believe that it would be good if each of us could have more varied experiences, rather than just sticking to one field for the whole time.

Fujie: On the other hand, the good thing about CTC today is that all the front-line engineers who communicate with

customers also have a certain amount of business sense. This enables them to negotiate with customers and calculate budgets and estimates. I feel that this is the result of fostering PMs, as we've been doing over the last 10-odd years. If these people could write their own programs and create things on their own, as well as develop a realistic imagination of what can be developed, CTC would become even more competitive.

Kubota: I am sure there are many people at CTC who want to create new things with their own hands. I think we can put our hopes in the potential afforded by promoting different types of in-house development. I hope that we at MIRAI can also do something to encourage this point.

SDG Activities and Changes in the Company

Satomi: Moving on, I would like to talk about your SDG-related activities. CTC is more of a "behind-the-scenes" supporter, making it difficult for us to openly talk about how we contribute to the SDGs, but I am certain that we do in fact contribute in many ways. Please talk about your specific efforts, to the extent possible.

Fujie: One of the business targets of SELMID, the ID package I am currently working on, is the idea of "official identification for all people." It is estimated that there are about 2 billion people in the world who do not have a family register or proof of identification. On top of that, some people have been expelled from their countries and had their passports expunged. Unable to prove their identity, they are often unable to open bank accounts, rent cell phones or rooms, or even find employment. We are exploring ways to use SELMID to enable such people to obtain IDs and participate in the economy. Rather than having a person recognized by the national or local government as "Mr./Ms. XX" based on family registers or identity registration, testimonies from people close

Tsugumi Watanabe
Expert Engineer
CTO Office/Advanced IT Strategy Division

Been working on presales of storage and servers ever since she joined the company. Involved in the launch of a local cloud service during her three-year assignment in Malaysia.

to the person are used as evidence of the person's existence and trustworthiness. The identity is then established based on distributed data sources and given a digital form. That is the core idea behind "SELMID." To make this mechanism work, we are now using distributed registers, creating connectors with businesses that have various forms of ID, and linking them to social security and tax number cards (i.e., My Number cards). At this stage, we are considering having our B-to-C clients use this platform to create business for us, but I think there may be

a way for us to have some more agency as a business ourselves so that we are the ones to be responsible for proving identity. When thinking about the SDGs, we would like to go beyond just creating a digital mechanism, and in fact, we are currently working on a plan to make it concrete.

Satomi: This is truly a wonderful initiative that can contribute to the SDGs, and I look forward to its future development. Ms. Kubota, I believe you were also involved in a meaningful project.

Aiko Matsumura

Systems Engineering Department No.3
Telecommunication Division No.2
Telecommunication Group

Involved in network design and construction for large-scale applications and virtual infrastructure ever since she joined the company, with a focus on Internet and mobile businesses.

Kubota: Yes. At MIRAI we are now looking into the feasibility of developing a logistical system for furniture with the so-called sustainable economy, or circular economy, in mind. It is quite common for people to buy a piece of furniture from some manufacturer, and then sell it to somebody else after having used it for a while. As an alternative, one could break down the product into its constituent parts, pick out those that can be reused, and circulate them back into the system. Such an approach of having items circulate at the level of their materials is called a circular economy. Looking at a bed, for example, the fabric parts of the mattress are difficult to reuse, but the steel coils inside can be melted down and made into something else. These could be recovered for reuse. Our goal is to create and commercialize such a system within furniture logistics.

Satomi: If we could make such a system work, it would be a great contribution to the SDGs.

Kubota: Yes, I think so. At MIRAI we are also considering other projects related to the SDGs. One of these is the creation of a transportation business structure following the Sampo-yoshi principle, that is, "good for all three parties." Transportation is a challenge for many senior citizens and others, and yet there are many regions where bus and train routes have been closed or scaled down because they are unprofitable. We want to make it easier for people to get around in such areas. We are working to create and commercialize a system that will benefit the transportation operators, the local people, and the local economy. I believe that we can actually accomplish quite a lot in terms of the SDGs by utilizing our IT technology.

Izumi: At the Science & Engineering Systems Division, we are working on wind power generation, as announced in June of this year. We have developed an original computational model to determine the optimal placement of wind turbines, and have confirmed that quantum

computing will enable us to perform the calculations in considerably less time than conventional simulations. Not only can this contribute to the efficient spread of renewable energy, the use of quantum computing technology can also cut down on the amount of power consumed to make the calculations. This project is expected to contribute significantly to the SDGs.

COVID-19 and the Introduction of Flexible Work Styles

Matsumura: Let me shift gears a bit and talk about the workplace environment, which I think is also related to the SDGs. I recently had a baby. I was hoping to work from home at least once a week when I returned to the office. Then the pandemic began. All of a sudden, more people were working from home, which made it easier for me to choose to work from home as well. If it weren't for the pandemic, I might have been more concerned about what my colleagues would think about me working from home. Now, if my child has a fever and has to stay home, I can work from home in the morning. In that sense, it has become a very comfortable working environment.

Satomi: Frankly speaking, I can completely understand that if the pandemic hadn't happened and CTC still had the same, pre-pandemic working environment, a working parent like Ms. Matsumura would be worried about what her colleagues would think about her working from home. I also sense that we have become much more flexible since relocating our headquarters last year. I think the pandemic was a turning point for us, allowing us to change the parts of our company that were behind the times, and we're now slowly getting better. What do you think?

Kubota: Until now, if an employee wanted to return to his or her parents' home somewhere far away and work from

Advertisement in the Nikkei Newspaper (published May 31) featuring the five engineers who participated in the roundtable discussion. In commemoration of its 50th anniversary, CTC is printing a series of advertisements over the course of this year, showing its employees taking on challenges with an eye toward the future.

there for a while due to some unavoidable circumstance such as a family or health issue, they faced restrictions. Starting this year, such distance work has become possible. I think it's a good change. I am also glad that we moved to this new office and now work in this relaxed, spacious area with no assigned seating. I'm able to meet people from other departments that I had not been able to meet before.

Yuki Izumi

Scientific Engineering Department No.2
Science & Engineering Systems Division
Enterprise Group

Currently working on simulations of seismic analysis of nuclear power facilities and quantum algorithms with a focus on numerical analysis.

This has led to discussions about work, ideas for doing things together, and so on, so I feel like the environment has improved.

Fujie: Although there are still plenty of things that need to be changed, I think we can say that we are becoming more responsive to diversity. I hope to see more such developments in the future.

The Joy of Contributing to Society and Creating Something New with Your Own Hands

Satomi: From what you have all said, I can see that we face various challenges at CTC. In terms of the SDGs, while it was encouraging to see several meaningful projects in action, I also felt that there are areas where we need a more concerted effort. I would like to share the opinions you have given me today with the rest of the company to inform how we approach the future. Finally, I would like each of you to tell me one thing you find rewarding or meaningful about your current job.

Kubota: Before coming to MIRAI, the thing I found most rewarding was to solve customers' problems. However, back then, my "customer" was the company. Now that I'm at MIRAI, my customer is society. It makes me feel like I have a more far-reaching perspective. I hope I can contribute in some way to improving society even if just a little bit. That makes me feel like my work has value.

Matsumura: It always makes me happy when I think that the things I've worked on have improved the lives of others, as well as my own life. Usually, people only notice networks when there's a problem, and that's a bit sad, but at the same time, that means that it has become so good that people can take it for granted. When I think about how I've contributed to making it so, it makes me glad. I would like to continue to work hard so that I can feel like I'm a part of that contribution.

Izumi: I am now in a position where I can do what I want to do, and I feel very fulfilled. I've been at a distance from AI topics for a while, but recently I've had more opportunities to work on AI, partly due to quantum machine learning. There are many difficulties involved in the research on quantum computing, but it's something that I want to do, so I'm really enjoying it. I hope I can continue approaching my work with this kind of spirit.

Fujie: Once, when my child was young, I was asked, "Daddy, what's your job?" That got me thinking, "What am I actually doing?" I know it's different for everyone, but I want to do something where everyone can clearly understand what I'm working on. I want to be able to feel that I'm having an impact on society. I now feel like I can do that in my own way, and that gives me a sense of fulfillment. I think it's important for the company that all of its employees can feel that way. And it's still a lot of fun to create something that makes everyone feel like life is getting better.

Watanabe: Since joining CTC, I have had the opportunity to try many different things and take on various challenges. I feel happy and rewarded when I gain some new skills and feel that I have grown, or when I can feel that I have helped someone. I hope to continue challenging myself and growing.

Satomi: Thank you all very much. As for me, I remember when I was writing a lot of programs at CTC and how happy I was when I sold a system I had created, and the customer was able to make full use of it. Recently, I have been in the position of being consulted by various people within the company, and every time I advise someone, I merely try to guide them so that they come to their own answers. Afterwards, when I see that the person has been able to set a course for his or her own work, that is the most rewarding moment. Or rather, I breathe a sigh of relief. Today, I was pleased and encouraged to see that each of you is making your own decisions and finding meaning in your work. Now that we have reached the milestone of our 50th anniversary, I would like to ask everyone to look back on the CTC of today from the standpoint of an engineer, think about how we can further contribute to our customers and to the world, and then put these ideas into action. I look forward to your continued work.
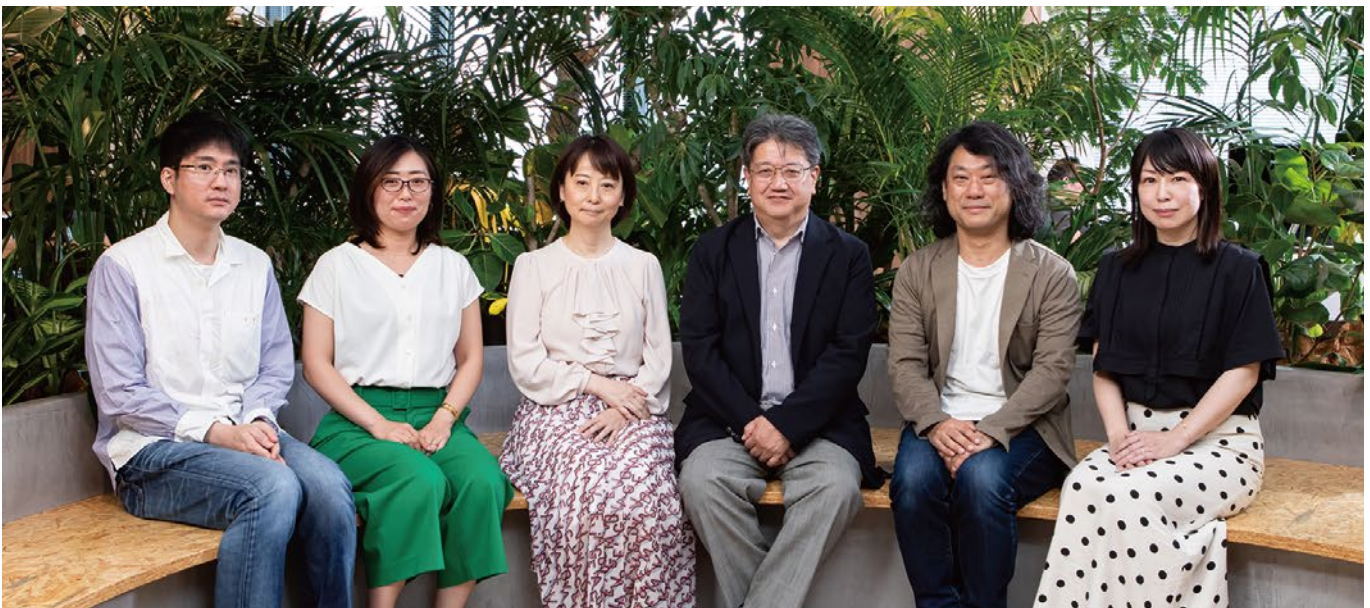
This issue's theme is...

【Quantum Cryptography】

With the rapid evolution of quantum computers, cryptography is now entering a critical phase. The security of today's cryptography is guaranteed by the fact that it is "virtually unbreakable" with the performance of today's computers, but the advent of quantum computers with speeds an order of magnitude faster could upend the system. For this reason, quantum cryptography is now gaining attention as a new cryptographic technology. The cipher is "unbreakable in principle," meaning that no matter how fast computers become, there is no danger of it being cracked, leading to high hopes for its realization.

Text by Yuki Kondo

The End of the Competition between Cryptographers and Cryptanalysts

People have been using various devices and mechanisms to secretly deliver information for thousands of years. All kinds of methods have been tried, from using invisible ink to shaving the messenger's hair and tattooing messages on their scalp, then waiting for the hair to grow back before having the messenger deliver the message. These devices have been developed because some people want to deliver messages in secret, while others want to "crack the codes" and read those messages. Cryptography has developed as these two rivals, the cryptographers and the cryptanalysts, have crossed swords. Countless stages of development have resulted in the creation of so-called public-key cryptography, which is said to be the most secure cryptosystem and has come into widespread use over the last 30 years or so.

The Crisis of the "Virtually Unsolvable" Cryptography

In cryptography, the message always has both a sender and a recipient. In order for the sender to deliver the encrypted message to the recipient and for only the recipient to be able to read it, the sender must provide the recipient (and only the recipient) with a key to decrypt the message, separately from the message itself. For many years, the biggest challenge in cryptography has been how to securely deliver that key. Encryption is pointless if the key can be cracked somewhere along the way. Conversely, encrypting the key makes it impossible for the recipient to use.

Public-key cryptography solves this conundrum. The core idea is that the *recipient* first prepares two keys, one for encryption (key A) and one for decryption (key B). The recipient makes key A public while holding onto key B for him- or herself. The sender uses the publicly available key A to send the encrypted message, and the recipient decrypts it using key B, which is only available to him or her. This method eliminates the need for the sender and recipient to exchange keys.

So how can we make keys A and B? One would think that if key A were publicly available, somebody might be

able to create the corresponding key B on their own. But that is virtually impossible. The reason is that keys A and B are made up of complex mathematical operations that take an extremely long time to solve with today's computing technology, no matter how powerful the computer.[1] It is possible to configure the encryption so that it would take hundreds of millions of years to crack, even if one connected all the computers in the world.

In other words, the security of modern cryptography is guaranteed by the fact that it is *virtually impossible* to solve, even though it may be possible *in principle*. However, the advent of quantum computing threatens this security. That is because quantum computers have the potential to be orders of magnitude faster, taking mere minutes to perform calculations that would take existing computers tens of thousands of years to complete.

A new way of cryptography was therefore needed to replace today's public-key cryptography, i.e., a cryptography that cannot be solved, no matter how fast the computer. It is against this backdrop that quantum cryptography has been attracting attention in recent years.

Quantum Cryptography: Encrypting Information by Loading Information onto Individual Photons

The original idea for quantum cryptography was born in the 1960s. It came from Stephen Wiesner, then an American graduate student, who proposed that the theory of quantum mechanics could be used to create "quantum money," paper money that could never be counterfeited. Intrigued by this idea, the two scientists Charles Bennett and Gilles Brassard realized in the 1980s that the method could be applied to cryptography and went on to develop the idea that

would form the basis of quantum cryptography.

The principle is based on the properties of photons—light particles. The method is to load each photon with a piece of information (either a binary 0 or 1), encrypt it, and send it, and when doing so, associate the direction in which the photon is oscillating with the information. Each photon oscillates in a certain direction, such as vertically, horizontally, and diagonally, so you can say that if the photon oscillates horizontally, it signifies a 0, and if it oscillates vertically, it's a 1.

Additionally, according to quantum mechanics, a photon can simultaneously take on multiple states when unobserved (i.e., simultaneously oscillate vertically and diagonally), and its state is only determined when it is observed. It does indeed sound strange, but it has been shown that such a property actually exists. By using this property, it was found to be possible to create a cryptographic mechanism that is absolutely unbreakable in principle. Not only can it deliver the decryption key with no chance of exposure, it can also detect the presence of anyone who tries to intercept it.[2][3]

Post-Quantum Cryptography as a New Standard

The important thing is that quantum cryptography is a mechanism that is unbreakable *in principle* by utilizing the quantum mechanical properties of light. This is a crucial difference from today's public-key cryptography, which is *virtually* unbreakable by way of being too computationally intensive. This means that we are in the process of creating a cryptosystem that can never be broken unless quantum mechanics itself is overturned, and once this cryptosystem is completed, we may be able to put an end

to the history of the development of cryptography.

However, quantum cryptography is still under development, and even if it is completed, it will not be easy to use and may end up being used only in fields that require extremely confidentiality. Against this backdrop, recent years have seen the widespread development of another option known as "post-quantum cryptography" (also called "quantum-resistant" or "quantum-safe" cryptography). While not unbreakable in principle, this new type of public-key cryptography uses mathematical problems that are difficult for even quantum computers to solve. In other words, it is "virtually unbreakable" to a higher degree. In July 2022, the CRYSTALS-Kyber algorithm developed by IBM and others was selected by the National Institute of Standards and Technology (NIST) in the U.S. as a post-quantum cipher that could become the global standard for Internet security in the future.

In terms of general security, the development of quantum computers and post-quantum cryptography may be the arena of competition for the next generation of cryptographers and cryptanalysts.

*1. There are several different schemes in public-key cryptography. The RSA cryptosystem, which uses the properties of prime numbers, is the most widely used among them. The public key corresponds to the number obtained by multiplying two large prime numbers, and the decryption key corresponds to one of the prime numbers to be multiplied. There is no easy way to factor the product of two prime numbers, requiring surprisingly time-consuming computations.

*2. For more on the principles of quantum cryptography, see *The Code Book* by Simon Singh. The details of its principles, which cannot be fully covered in this article, are presented in a very accessible way. This article also draws heavily on this book.

*3. Research is also underway on photonic quantum computers, which use photons to perform calculations. Such quantum computers would be compatible with the quantum communications that use the properties of photons.

ITOCHU's Digital Group Strategy

With the basic concept of "DX originating from business problems," ITOCHU Corporation takes a market-oriented approach to digital transformation (DX). In order to grasp the changes in the world and successfully support DX, we form business groups with partners who possess superior technology, expertise, and data.

ITOCHU Corporation: 100 Offices Doing Business in 62 Countries Around the World

As a globally operating general trading company, ITOCHU Corporation has around 100 offices in 62 countries around the world. Our eight operating companies (the Textile Company, Machinery Company, Metals & Minerals Company, Energy & Chemicals Company, Food Company, General Products & Realty Company, ICT & Financial Business Company, and the 8th Company) are engaged in a wide range of businesses, starting with domestic, foreign, and tri-nation trade, but also including investment in domestic and foreign businesses. While other general trading companies have strengths in the trade of energy and resources, ITOCHU has long been a leader in the lifestyle and consumption-related segment and has conducted business in all areas related to people's lives.

The 40-Year Track Record and Three Strengths of the ICT Division

The ICT Division of the ICT & Financial Business Company is engaged in the business of DX. We propose DX expertise and services within and without the Group and support the transformation of businesses through the use of IT and digital technologies. The ICT Division has three major strengths. The first is the ability to utilize IT and digital technology, achieved through partnerships with CTC and other leading companies

that possess specialized capabilities in each area of IT and the digital space. The second is the ability to improve the customer experience through our extensive touchpoints, including BELLSYSTEM24, the biggest player in the industry, and our ability to enhance those touchpoints. The third is our ability to access and leverage innovation to develop new businesses, an ability gained through our track record dating back to the 1980s of having established many partnerships with leading Silicon Valley startups and leading them to success. We are using these three strengths to accelerate our DX business.

Responding Instantly to Changes in the Market and Industry Structure with the DX Business Group

ITOCHU positions DX as a tool to support an organization's growth strategy from behind the scenes. Our basic philosophy is that DX must not be an end in itself. Rather, it must "have its feet on the ground" and be oriented toward both the business and profitability. Until now, the ITOCHU Group has developed its IT services business around CTC and BELLSYSTEM24. However, in this rapidly changing world, it is becoming increasingly difficult to support customers' DX from the conventional starting point of system integration (SI) alone. Recognizing that the starting point of DX is shifting further upstream, we have been establishing partnerships with leading

The Three Strengths of the ICT Division

Using IT and digital technology to evolve businesses	Enhancing touchpoints to improve the customer experience	Developing new businesses by accessing innovation through investment in startups

Reinforcement and Expansion of the DX Business Group	Further Expansion of Investments in Startups

Flexible creation of new industries and evolution of existing businesses based on an appropriate understanding of the changes in market/customer values and the industrial structure

Acceleration of market-oriented business transformations across all industries and companies

Shinichi Omoto

Manager
IT Business Section No.2
Information Technology Business Department
ICT Division
ICT & Financial Business Company
ITOCHU Corporation

companies that possess specialized capabilities in every field of DX, forming the DX Business Group to support our clients in their business transformations.

Forming the DX Business Group with Leading Companies in Five Fields of DX

The DX Business Group consists of the following five fields and companies with strengths in those fields, which we connect and combine to support our customers' efforts to drive DX.

The Five Strengths of the DX Business Group

● Business and Digital Consulting
We provide business consulting services incorporating a digital perspective to address our clients' business issues, as well as digital services that enhance the value of the customer experience.

● Development and Operation of Applications and Systems
We offer full services starting from the development of systems based on modern application architecture to handling operations after the implementation of DX.

● Digital Marketing and Promotion
We provide services to support our clients in deciphering their business issues, developing digital marketing strategies, and executing promotions.

● CRM and Customer Experience
We provide BPO services that enable our clients to sort out their business issues and concentrate on essential business operations, as well as services that ensure ongoing customer success.

● Data Analysis and Utilization
In addition to supporting our clients to convert from paper—the greatest obstacle to DX—to digital, we offer sophisticated analysis of the vast amounts of data generated by our clients' businesses and operations, as well as services to accelerate our clients' DX by utilizing the results of the analysis to improve or develop their next service.

Case Study | Transforming the Business of NIPPON ACCESS with the DX Business Group

Following its corporate philosophy of "a taste that touches your heart," NIPPON ACCESS, one of the core companies of the ITOCHU Group, aims to become a wholesale company that transcends the boundaries of wholesale. With the Fourth Industrial Revolution and SDGs gaining momentum in various fields, NIPPON ACCESS is also expected to make use of data to achieve efficiencies, create new businesses that will increase profits, and reduce food waste and loss.
Having positioned the optimization of food supply chains through DX as a key measure, NIPPON ACCESS collaborated with ITOCHU Techno-Solutions Corporation, which has a high degree of expertise in IT, and BrainPad Inc., a leader in data utilization, to carry out a verification experiment using retail sales and other data to forecast demand and automate orders. Since the experiment has proven to be effective, operations are being expanded on a nationwide scale.

NIPPON ACCESS Case Study
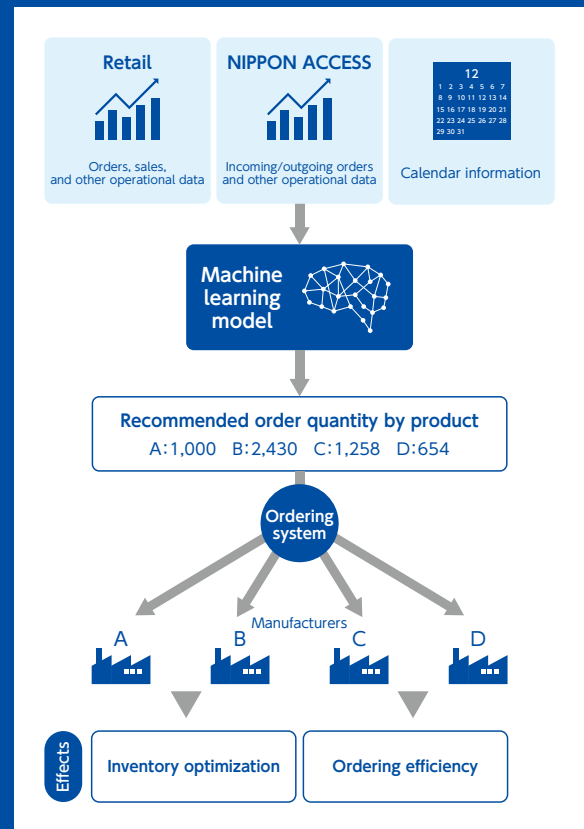
The PITWALL Project
CTC America's Approach to Tackling Issues at Development and Operational Sites

Hisa Tanaka
CTO & Sr. Director, Engineering
ITOCHU Techno-Solutions America, Inc.

Joined CTC in 2003 and worked as an engineer in charge of telecommunications carriers before being transferred to the United States. In addition to developing commercial products, oversaw business development and launched businesses in the Open Compute Project and the Cloud Native field.

Observability and the Tools in Each Field

As smartphones and apps become ever more ubiquitous and the proportion of the population made up of digital natives increases, so do users' expectations regarding UX/UI. Application systems development must respond with a greater emphasis on continuously improving and adding functionalities.

In this environment, our focus is on Observability, which seeks to accurately grasp the status of increasingly sophisticated and complex systems (e.g., operating status, customer usage trends, security and compliance, etc.). In addition to logs, metrics, and tracing, tools have been developed to manage a variety of data, including configuration information.

CTC America's View on Issues at Development and Operational Sites

Under these circumstances, each technological area continues to fragment and evolve, and it is not uncommon for companies to use not one but a combination of tools, with different combinations for different departments and generations of systems. We have therefore focused on the following issues that are actually occurring at operational response sites (e.g., with event analysis teams responding to failures and security incidents).

Sustainability Issues at Development and Operation Sites

Productivity Issues	Manually switching between multiple tools to gather information.
Quality of Response Issues	Longer response times for failure analysis and recovery.
Organizational Issues	Response processes that are neither visualized nor standardized. High dependence on a few experts.

Due to these issues, the actual development and operation sites still require significant manual work and can only be handled by a limited number of staff, despite the increasing sophistication of individual tools that help to increase development speed and shorten release cycles. This poses business continuity problems for the organization.

PITWALL* — An R&D Project of CTC America

"How can we approach the organizational issues faced by the development and operation sites?" We started the PITWALL project through dialogue with companies seeking solutions to the above issues in the U.S., where cloud nativization in enterprises is far ahead and startup technologies are enthusiastically being adopted. Through this initiative, we are exploring approaches for the deeper and sustained solving of issues.

Why CTC America is Promoting the PITWALL Project
- CTC has been involved in customers' operation sites from a position one step closer to the customer.
- The spread of cloud-native software in the U.S. and the accompanying development and maturation of software development technologies have lowered the barriers to entry for product and service development.
- We want to develop a new business model to take on the U.S. and global market.

The PITWALL Prototype

PITWALL connects a variety of tools used in development and operation sites and instantly retrieves the necessary information. It acts "behind the scenes," focusing on analysis and considering improvements. In the process, it also works to share expert knowledge by visualizing and standardizing the response process, with the goal of continuously improving processes in the organization.

In order to support ever more customers to achieve sustainable growth, we will continue to promote the expansion and enhancement of PITWALL's functions as we aim for a full-scale release. Please get in touch to learn more.

Overview of the Prototype

Studio	Define and visualize the response process when an incident occurs. No changes required to existing tools.
Automation & Insights	Instant access to tools and analysis support across multiple tools for failure response and when incidents occur.
Debrief	Knowledge sharing at the team level, feedback, and continuous improvement of processes.

Response Flow When Application Errors Occur (In-House Use at CTC)
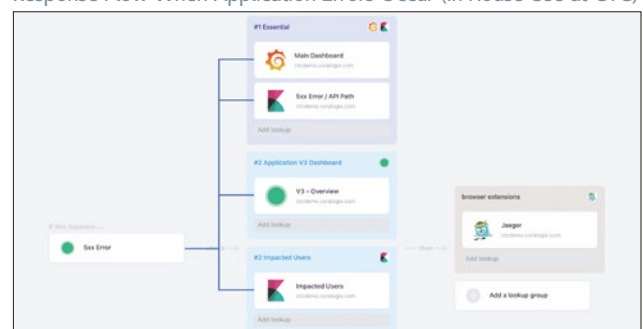
News Pickup

Here is information on solutions and services
featured in CTC news releases.

Security

Launched Threat Intelligence Monitoring Service

We launched our Threat Intelligence Monitoring Service, which monitors trends in the latest methods of cyber attacks and client companies' confidential information leaked on the Internet. Using the Recorded Future Intelligence Cloud platform, a threat intelligence service provided by Recorded Future, Inc. in the U.S., the service detects and reports on client companies' confidential information that has been leaked on the Internet, including the dark web. The service is offered as a part of the CTC security brand CTC-MSS to companies seeking to strengthen their security.

GX / Science and Engineering

Supporting Corporate Green Transformation (GX)

We have systematized our carbon neutrality-related solutions and services to offer them as green transformation (GX) service packages, where previously they had been offered individually. The services include support for the visualization and reduction of corporate greenhouse gas (GHG) emissions, the introduction and utilization of renewable energy, and the construction of data utilization infrastructure for these purposes. We will contribute to GX by providing services to companies and organizations based on the simulation technologies we have accumulated over the years through the weather data analysis and simulations that we launched around 1990, as well as the consulting and system development services we have been providing to renewable energy power generation companies.

AR / VR

Launched a Metaverse Development Environment Simple Introduction Package for Enterprise

We launched the Omniverse Starter Package, a simple introduction package for the metaverse development environment that utilizes NVIDIA Omniverse Enterprise, NVIDIA's metaverse development platform. By offering the hardware and utilization planning in a package, we made it possible for companies to build and use a metaverse in a short period of time. The utilization planning service explains the Omniverse functions, provides examples of their utilization, and holds workshops on theme creation. We employ Dell Technologies hardware to provide comprehensive support from installation to operation.

Innovation / Human Resource Development

Becoming a Scholarship Partner of Kamiyama Marugoto College

CTC became a partner in the scholarship program to eliminate the need for tuition at Kamiyama Marugoto College of Design, Technology, and Entrepreneurship, a private technical college to be opened in the town of Kamiyama in Tokushima Prefecture. With the goal of promoting the development of the next generation, we contributed one billion yen to the Kamiyama Marugoto Scholarship Fund. At CTC we consider "developing the human resources that will support the future" as a material topic, and we will work together with prospective scholarship recipients on joint research, creating new businesses, and other initiatives. Through our support for and education of the next generation of human resources, we will contribute to the development of a rich and dream-filled society.

DX / Agile Development

Developed Team on Air to Facilitate Communication among Agile Developers

Agile development emphasizes communication between developers. We therefore developed the desktop application Team on Air, which improves development efficiency by enabling voice-based sharing of information. Once the duration of a sprint (short development unit) is registered, the system automatically sets up a schedule for planning, small daily meetings, reviews of results, and discussions on the work to be done, and delivers the daily schedule in an audio format. Users can monitor the status without interrupting their development work, leading to more efficient agile development, which requires close communication.

Science & Engineering / GX

Launched a Methanation Simulation Service

We launched a materials analysis and simulation service, which uses materials informatics (the streamlining of materials development with IT) to support the path toward carbon neutrality. This consulting service helps customers to reduce their CO_2 emissions by way of methanation simulations (simulating the synthesis of methane [CH_4], the main component of natural gas, from hydrogen [H_2] and carbon dioxide [CO_2]) and reducing materials through the recycling of material scraps in factory manufacturing processes. We developed this GX solution based on more than 30 years of experience in the field of materials analysis.

Please visit the following for further details (Japanese only).

https://www.ctc-g.co.jp/company/

The Best Golf Course in Japan, Born by Chance and Nurtured by the Deep Love of the Golf Club's Members

The course consists of 18 holes designed on an optimal site
by British golf course architect Charles Hugh Alison,
known for his deep "Alison bunkers." The site and design were a combination born of coincidence.
Hirono Golf Club is known for being a highly strategic course and has continually rated highly in the world.

It is an established opinion that Hirono Golf Club ("Hirono GC") is Japan's most renowned golf course. Every two years, the American magazines Golf Digest and Golf Magazine select the top 100 golf courses of the world. Hirono GC has never given up its top position in Japan to any other golf course in the country. In terms of global ranking, in 2020, Hirono GC was ranked No. 13 in the world by Golf Digest, which was a meteoric rise from its 50th place ranking in 2018. (I will touch upon the reason for this later in this article.) In Golf Magazine's world top 100 ranking announced in 2021, Hirono GC was ranked No. 39.

Hirono's history is not particularly old. Japan's oldest golf course is the Kobe Golf Club that was founded in 1903. Hirono GC opened 29 years later in 1932 as Japan's 24th golf course. Even in the Kansai region, it is younger than Maiko Country Club (now Tarumi Golf Club), Naruo Golf Club, Ibaraki Country Club, and Takarazuka Golf Club. Then why is Hirono GC number one in Japan? Let's consider this from the aspects of both the golf course and the club.

Alison Completed in Only Three Days, the Design of 18 Holes on the Site Found by Chance

Hirono GC is said to have been born by chance. That is, at the time in 1930, officers of the Maiko Country Club, which only had 9 holes at the time, wanted to build an 18-hole golf course and visited a candidate site. However, they were disappointed by what they saw and were on their way back in low spirits when they happened to pass by a rural village in Hyogo Prefecture. By chance, they "discovered" a parcel of land that would have been suitable as a Scottish links golf course both in terms of terrain and scenic beauty. The parcel of land was part of an estate owned by Viscount Takayoshi Kuki, a former feudal lord. As luck would have it, the Viscount was the executive head of Maiko Country Club. Talks to purchase the land proceeded smoothly and an agreement was reached to buy the land for 35 sen (0.35 yen) per tsubo (about 3.3 square meters). Incidentally, the aforementioned officers of the Maiko Country Club included Seiichi Takahata and Chozo Ito, who played important roles during golf's infancy in Japan. In other words, you could say that the Hirono GC was focused on these members, who had the knowledge and sensibilities of British-style golf, and that was how its insight as a golf club was established.

The many bunkers are reminiscent of Scottish links. The golf course was renovated in 2019 to restore Charles Hugh Alison's original design.

The club house, with its tranquil atmosphere, stands majestically in front of visitors who get off at Hirono Golf-jo-mae station on Kobe Electric Railway's Ao Line.

Fireplace in the club house's bar lounge. The people who supported Japan's golf enjoyed conversations about golf while sitting in front of this fireplace.

I digress. To get back to how the course came about, Hirono GC was designed by Charles Hugh Alison. This, too, was blessed by chance. Alison happened to be in Japan to design the Tokyo Golf Club's Asaka Course. Takahata took on the task of negotiating with Alison but at first it was only for creating a routing plan. However, after inspecting the proposed site, it seemed Alison was very much attracted by its terrain. He left word that he was not to be disturbed for three days and holed up in his room at the Oriental Hotel in Kobe. On the morning of the fourth day, he completed a 1:1,200 scale blueprint for 18 holes. The fee for designing the course was 500 pounds. Upon seeing the design, Takahata, Ito, and their colleagues were impressed by the impeccable design and asked that a precise blueprint be created for another 1,000 pounds.

Construction began in February 1931. Ito, who had visited illustrious golf courses in the UK and US, served as the shaper (site supervisor). He was assisted by Osamu Ueda (later general manager and golf course architect), who had just graduated from Kyoto Imperial University's Faculty of Agriculture. They visited golf course shaper George Pengrace, who was on site for construction of the Asaka Course.

Pengrace, brought on board from the US, was known as a first-rate shaper. The land preparation work was carried out using horse-drawn wagons and trolleys, and it took about one year and three months from the beginning to the end of construction.

Hirono GC's green was modeled after the Asaka Course, and a one Bent green was adopted. Here, too, I feel the consistency of the Hirono GC. The golf club was requisitioned at one point as part of the wartime effort of World War II (used as an alternate runway for Kawasaki Heavy Industries' Akashi Airport). After many setbacks, when it was rebuilt as a full restoration of Alison's design, Hirono GC had a Korai grass green. It was returned to a Bent green in 1988. Even if the grass changed, the one-green system was kept throughout instead of a two-green system, which is an anomaly in golf course design. The legitimacy of the course design was preserved.

Leading Japan's Amateur Golfers Highly Independent Members

I feel that a golf club is ultimately created by people. The aforementioned Takahata, Ito, and Ueda came together at the start of the Hirono GC. For its restoration following the end of World War II, a strong leader, who did not bend to pressure from the Supreme Commander for the Allied Powers (aka the GHQ), appeared. It was Toyohiko Inui, who later served as CEO of the Japan Golf Association. You could say that he was the restorer of the Hirono GC. Owners of leading private companies in Western Japan were the main members of the golf club with Inui at the center. Their children also succeeded the wishes of the golf club, and talented players also came to Hirono GC, including members such as Giichi Sato, Junzo Shibamoto, Noriyuki Miyoshi, Kazuyuki Ohashi, and Ginjiro Nakabe—all powerhouse members. For five consecutive years starting in 1936, medalists of the Japan Amateur Golf Championship were players affiliated with Hirono GC.

One of the reasons why the independence of its members is being maintained at Hirono GC is probably that its operation is not as an incorporated association or a joint-stock corporation but rather as an unincorporated association.

There are original rules and etiquette for Hirono GC, which were developed with the agreement of members. For example, if on a par 3 hole, the ball of the player in the group behind you lands on the green, no applause is given. Caddies do not go on the green. Ball cleaning is done by players themselves.

In 2018, Hirono GC steered its way back to returning to the original Alison design, and sent a renovation request to Martin Ebert, architectural adviser to seven British Open venues. Ebert used drones and other means to restore the two-dimensional blueprint to 3D form. This is likely what led to the jump in Hirono GC's ranking that was mentioned at the beginning of this article.

Taizo Kawata

Chairman, Japanese Society of Golf Course Architects
President, T&K Incorporated

Born in 1944 in Tokyo. After studying at The Ohio State University, graduated in 1967 from Rikkyo University's Department of Law. His career includes the design of 23 golf courses and the remodeling of 29 golf courses. Has also served as a referee at major golf tournaments, including the British Open and the US Open.

CTC未来財団

ITOCHU Techno-Solutions Future Foundation

A Foundation for the Next Generation

The ITOCHU Techno-Solutions Future Foundation was established on October 1, 2019, with the purpose of "fostering the next generation of young people" who will challenge the future-changing possibilities of IT and contribute to the achievement of a sustainable, rich and dream-filled society. Funded by ITOCHU Techno-Solutions Corporation (CTC), the Foundation was recognized for being engaged in support activities of a highly public nature from the time of its establishment. As such, on March 1, 2021, the Foundation received certification from the Cabinet Office as Public Interest Incorporated Foundation ITOCHU Techno-Solutions Future Foundation. To the Japanese principle of Sampo-yoshi (good for three parties), "good for the future" was added to create Yompo-yoshi (good for four parties). The Foundation engages in activities under three pillars—to provide educational support for nurturing children's interest in IT and flexible mindsets, to provide academic support for highly aspiring students who wish to transform the world by leveraging IT technologies, and to provide academic support as well as support for creating employment opportunities to enable youths with disabilities to live productive lives.

IT Education Support Program for Children and Youths

This is a program for children and youths, who will be responsible for the next generation. Activities include the loaning-out of programming learning aids for elementary school children free of charge as well as the planning and hosting of programming workshops for elementary school children to nurture logical thinking.

Academic Support Program for Youths with Their Sights Set on IT

This program provides youths studying at target universities with grant-type scholarships that do not need to be repaid.

Academic Support and Employment Opportunity Creation Support Program for Youths with Disabilities

In this program, academic support is being provided to youths with disabilities, and disability support is provided to universities and various other organizations that engage in IT-related efforts necessary for creating employment opportunities for youths with disabilities. Past achievements include support for the provision of grant in aid for research and development, disaster response, the purchase of equipment, and application development.

Development of a New Learning Tool: Bebras Challenge Flashcards

The ITOCHU Techno-Solutions Future Foundation developed an informatics flashcard learning tool for elementary school children together with the Japanese Olympiad in Informatics. The cards were born from the Bebras Computing Challenge, which is an international informatics contest. The Bebras Computing Challenge began in Lithuania in 2004 and had spread to 54 countries by 2021. The Bebras Challenge learning tool consists of 40 flashcards for children in grades 1 through 4 and 28 flashcards for children in grades 5 and 6. A single card contains one question. The subjects are based on informatics and computational thinking. They are designed to help children develop logical thinking while answering quizzes as well as learn basic programming concepts.

The flashcards are A5-sized (5.8 x 8.3 inches) and can also be used in group settings. To date, 500 sets of flashcards have been donated to educational institutions.

Look HERE for further details (Japanese only). ▶ https://bebras-top.eplang.jp/bebrascards

Principal Group Companies

Japan

CTC Technology Corporation (CTCT)
Kamiyacho Trust Tower, 4-1-1 Toranomon, Minato-ku, Tokyo
https://www.ctct.co.jp/en/

CTC System Management Corporation (CTCS)
Kamiyacho Trust Tower, 4-1-1 Toranomon, Minato-ku, Tokyo
https://www.ctcs.co.jp/

CTCSP Corporation (CTCSP)
Kamiyacho Trust Tower, 4-1-1 Toranomon, Minato-ku, Tokyo
https://www.ctcsp.co.jp/english/

CTC Facilities Corporation (CTCF)
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https://www.ctcf.co.jp/

CTC Business Service Corporation (CTCBS)
Kamiyacho Trust Tower, 4-1-1 Toranomon, Minato-ku, Tokyo
https://ctcbs.ctc-g.co.jp/

CTC Business Expert Corporation (CTCBE)
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