Semiconductor Technologies Accelerate Our Future Vision: “ANSHIN Platform”

Tsuneo Komatsuzaki, Yasushi Matsumoto, Yoshihiko Hiraoka, Yohei Kaieda, Hiroki Kunii

Intelligent Systems Laboratory, SECOM CO., LTD.

Abstract

Since its founding in 1962, SECOM has been striving to create a plentiful and comfortable society through services with advanced technology. Our corporate philosophy is to contribute to human well-being, and our achievements are highly praised by society. VLSI technology is indispensable for our service. We describe our "service chain", our unique concept to realize further services and innovation in the future, and expectations for VLSI technology.

Characteristics and overview of SECOM

Characteristics of SECOM

SECOM was founded by two young people in 1962 as the first company of security service in Japan. Our corporate philosophy is to contribute to the happiness of people by providing social system services with advanced technology. The corporate vision for the past three decades has been "creating social system industry". SECOM, which began in the security business, provides safe and secure services in the seven business fields shown in the “Fig. 1”. The characteristic of SECOM is to support people's safe, secure, convenient and comfortable life comprehensively through service collaboration using the common platform by fusion of people and technology. SECOM group is engaging in service innovation concretely, and seriously. Its attitude is highly praised by society. In addition, we actively promote cooperation with public services (e.g. police, medical and transportation) and other company's services, and we are working on realizing a plentiful and secure society. In May 2017, we established a new corporate vision the "ANSHIN Platform". SECOM's mission is to provide peace of mind that remains constant in an ever-changing society, and ANSHIN Platform is an important vision that shows efforts to realize it.

Corporate culture

"Thinking about society" is "thinking about people". The essence of society is each person and family. Communities, Countries and the world are made up of relatives, neighbors, workplace colleagues, and so on. This is the basis of society. Therefore, "OMOI : The will to act for people and their happiness” for people and society becomes the driving force for creating new social system services. It is SECOM's business to shape "OMOI". In order to realize it, we have emphasized four items: (1)"People" sharing "OMOI". (2)"The organization" with no compromise and full of justice. (3)"Schemes" which continue developing. (4)innovative "R&D capability". We have been striving to work on innovation of social system services with "OMOI" as the driving force.

Service innovation for a plentiful and comfortable society

Innovative service based on advanced technology

SECOM has realized various innovative services by utilizing advanced technology of the era. As represented below, we have provided various kinds of Japan's first or world's first service:

- SP Alarm(1966) : Japan's first on-line security system
- SECOM AX (1998) : Detecting intruders using image recognition AI
- COCO-SECOM (2001) : Finding owner's position and emergency response with GPS
- Walk-through face recognition (2014) : Face recognition system without stop for authentication
- SECOM DRONE (2015) : Autonomous drone system for private crime prevention
- SECOM Airship (2016) : Effective Monitoring Broad area

The future of Japan

Japan has become a super-aged society as a modern state first. According to the definition of WHO, it is a "super-aged society" when the aging rate exceeds over 21%. Japan became a super-aged society in 2007. In Japan where aging and population decline progresses, and many people speak of

Fig. 1 SECOM's services

Fig. 2 World's aging rate
as "aging problems". However, we think that aging of society should not be called a problem. "Super-aged society" itself is the good result of realizing people's happiness through the efforts of many people and the technology. The problem is that the structure of the existing social system cannot fully cope with the change by "super-aged society". To solve the problem, innovation of social system services are necessary.

**Social capabilities "Offense power" and "Defense power"**

In an aging society, both "Offense power" and "Defense power" must be good work in order for society to remain plentiful. Briefly, "Offense power" is to earn money, and "Defense power" is to use the money effectively. In Japan, despite the sharp drop in population, we have improved "Offense power" with technologies such as industrial robots and ICT. On the other hand, the social system service, which is the most important part of "Defense power", depends mainly on labor force, and application of advanced technology is not sufficient. For Japan, the most important issue of the future society is to strengthen "Defense power" using advanced technology, as with we have improved "Offense power" so far. And "amplifying human power" by technology enhance the "Defense power".

**Enhancement of "Defense power" through service innovation**

Amplification of "Defense power" also strengthens “Offense power”. In other words, the technology for “Defense power” will amplify the power of both sides of offense and defense. This amplification of human power is an essential requirement for Japan to sustain affluent in super-aged society, and it should be applied not only to security, but also to all fields such as medical care, nursing care, disaster prevention and so on. SECOM considers that amplification of human power is the most essential value of technology.

There is one more essential value of technology. It is to construct a common operation process for various safe and secure services to realize a secure society. We call it "Fundamental Operation Process" for safe and secure service. This process consists of the following three steps. (1) Finding "Small Changes" accurately. (2) Understanding "Meaning of Changes". (3) Responding effectively based on "Meaning of Changes". SECOM has already realized amplification of human power through maximum use of technology in security business. The following is an example. SECOM has approximately 2.3 million security service contracts in Japan. If all this were realized by human operation, it was necessary to have security guards of at least 10 million people (minimum 5 (people / site) * 2 million sites). In fact, we provide services with about 20,000 security guards.

This example shows that the power of one person was amplified 500 times at the minimum. And here, people should entrust the work that does not have to be done by a person to the technology and concentrate on the work that must be done by a person. This approach shows the right way how the jobs should be done by humans, while respecting human dignity. This is a very important idea also in social application of important technologies such as AI and IoT.

**Proposal of a new concept "service chain"**

**Clear vision of services**

There is no definition of service that everyone agrees. We define service as "all acts that people do for others". Companies that provide services directly like SECOM are classified as "service industry" in the Japanese industry classification. And the businesses who manufacture many products indispensable for providing services are classified as "manufacturing industry". For that reason, it is common to mistakenly recognize that "service industry" is providing services and "manufacturing industry" is distant from service.

It is not correct. Because private sectors such as manufacturing and distribution industries and public sectors such as administrative departments are all involved in providing services, whether directly or not. We believe that all organizations and companies contribute to the service of social system services, and there is no unrelated one.

**Conversion of viewpoint and extension of service concept**

The concept of Cyber Physical System (CPS) and Society 5.0 which are the consciously approaches to integration of technology and service provision, and we believe this movements is a very good approaches. However, important parts may be missing. It is a "link" between customers and operation processes that provide service to it. The concept of "supply chain", for example, stands on the viewpoint from the provider side. The world will be changed when we switch the point of view 180 degrees to viewpoint of customer side. This shift of viewpoint will show us the important things that we were unconscious. One thing is the first "link" of chain connecting a customer and the other thing is to think of a new service starting from the physical world.

Social system services originally were all physical services and have evolved by utilizing technology for "tool". Social system services offered in the physical world are strongly constrained by space and time. If there is no technology, "unnecessary" actions such as movement and waiting were absolutely necessary for "necessary acts" in daily life such as school, hospital visits, shopping, and entertainment. However, by connecting with the network cyber world, it became possible to talk without meeting people, and the traveling time was shortened. Also, even in various other living situations, wasteful movement and waiting time were greatly shortened by utilizing web services and the like.

In order for CPS, Society 5.0 to truly exert its effect, it is necessary to think about what customers will be happy from the viewpoint of customers from a customer perspective, think about customers with "OMOI". The "OMOI" designs the first ideal link connecting customers and various services. Connect the "link" with the chain constructed in the framework of CPS and Society 5.0. This creates a huge chain in which all people, organizations, mechanisms, and technologies related to customers and services are comprehensively connected. We call this chain as "service chain".

"Service chain" is a concept of a connected social system in which all the entities provided to customers by the fusion of the physical and cyber world are fully integrated by technological innovation, and are provided to customers as
services mainly by physical ways. Therefore, the fusion of both cyber and physical systems that we consider is "Physical-CPS" (PCPS) originating from the physical world where customers are located.

**Fusion of physical and cyber for service innovation**

Synchronizing physical and cyber services - Expansion of information services

Cyber technology development has evolved at a phenomenal speed far exceeding the imagination of many people. Due to dramatic improvements in information processing and communication speed, work following predetermined procedure is executed by orders of magnitude faster than by people. In that sense, computer technology realized innovation in the dimension of time. On the other hand, the physical world is a 4 dimensional world composed of time and 3 dimensional spaces. The evolution of the physical world is relatively slow compared to the fact that there was a dramatic speed improvement in the cyber world.

Social system services are provided in physical world by people making full use of muscles and brain. Of course, information services are also utilized there, but most of them are for information processing, and they are effective only as a part of social system services as a whole. Nevertheless, information-based services have brought about great innovation by reducing wasteful time and distance. By further utilizing it to change the physical operation in the future, further social innovation can be expected. However, these changes are an effect of improving the connection between physical elements filled with waste and inefficiency, and few are related to the transformation of the physical elements themselves. We humans living in a physical world have limitations of function as organisms.

For example, map information services realized great progress because it makes it easy to understand the distance, time, and transfer method to a destination. However, an arrival time of a train does not become early. In order to realize shortening of traffic time, technological innovation from the "physical service perspective", such as train operation management and controlling the flow of crowds, is indispensable in various fields related to transportation system.

Realization of "service chain" by fusion of physical and cyber

As already mentioned, SECOM succeeded in using the fusion of physical and cyber to amplify the power of a person at least 500 times in the field of online security. In the first half of the 1980s, communication with all contractors was transferred to computer networks, and various sensors were developed to increase the types of abnormalities that could be discovered. At present, approximately 60 million sensors are installed in approximately 2.3 million contract customers, and monitoring 24 hours a day, 365 days. Also, we manage a large amount of customer data accumulated severely in SECOM's data center in Japan. And, in order to enable quick human response at any time, we are deploying approximately 3000 emergency depots throughout Japan. However, considering services for the future and service systems based on the "service chain", the current appearance is not perfect. We will expand the "service chain" that we have been building so far toward the realization of great value social system services in the future society by cooperating with services of other fields and cooperation with administrative services, and we will realize the best service based on PCPS.

The value of “service chain” and technology for realization

The social value of the “service chain” is the amplification of valuable human power and construction of the Fundamental Operation Process of safety and security services. This is a "future value" to developed countries. In this section, we will describe sensing technologies, secure chip development with semiconductor manufacturers, research on communication optimization with telecommunication carriers, which is required for technology to realize “service chain”, and clarify the relationship between “service chain” and VLSI.

"Copy" from physical world to cyber world

Sensing technology is the core technology for "Copying" social movements into cyber world, such as human activities in physical world, movement of things, and situation of social system resources. What is required for sensing technology is fidelity. Signals acquired with sensors should always be "copied" faithfully to entities. Resolution, accuracy, SN ratio, etc. are important technical factors. On the other hand, there are various disturbances in the real environment, and threats such as disturbance and malfunction by a malicious person must be considered. In order to ensure that the sensor always operates correctly it is important to use the sensor to acquire the desired signal and surrounding environmental information and understand the relationship between disturbance and true value.

As we expect high performance sensors, we also require that they also meet user friendliness. Various functions such as size that can be installed anywhere, long maintenance free, power saving, self-check, etc. are integrated in a small space and VLSI must be used in order to realize the above advanced functions Technology. Also, in addition to sensing about people and things, technology to sense physical world is also important.
Hardware security for reliable "entrance" of the “service chain”

We have repeatedly stated that the first "link" with customers in the “service chain” is important. From the viewpoint of supply chain, this "link" seems like far "exit". However, in the “service chain”, this "link" is the entrance, and the most important "parts" that have great impact on the process of all subsequent chains.

The key of a trusted service is the accountability of "copy" from a physical world. In the "link" place where general people contact with the service (e.g. home), we cannot introduce large-scale and robust cyber security product like a data center. The technology which create trustworthy "link" is extremely important.

The more abundant information captured from the sensor, the more "copy" of physical world can be precise, it will be possible to provide a better service. On the other hand, adverse effects become very serious. From the viewpoint of the customer, the accountability of information and its traceability are important elements supporting the reliability of the service.

Hardware security technology is important as a technique to make information captured from sensors accountable and traceable. By combining hardware security with cryptography, the data is sent to the cyber world correctly without rewriting or leakage of information illegally. Concretely, cryptographic techniques are used to conceal and prevent tampering of information captured from sensors, and hardware security protects the cryptographic key for authenticating the correct destination. For this reason, the chip constituting a highly functional sensor must contain a secure tamper resistant region for concealing encryption key / encryption processing. To realize trustworthy "link", SECOM and Renesas Electronics collaborate on security technologies of semiconductors and the construction of a platform which designed for secure chip. It is becoming more and more important that such collaboration in order to protect the value of the “service chain”. By combining technology of semiconductor manufacturers and technology of service companies. Our shared vision is construct a platform that keep the accountability and its traceability the whole “service chain”. This platform is a very strong item for service company, making it possible to create various new services.

Establishment of optimal communication infrastructure

Information that "Copy" physical world is processed in cyber world and delivered to customers as a service. With the benefit of the spread of the Internet, we have been able to deliver data to the back side of the world in a flash. But in reality, much of the information produced in the physical world is consumed near the production site. Information is delivered all over the world, but the case where it is used as a physical service far away from the place of production is very rare. Speed is important when physical service, especially urgency is required.

From this point of view, it is effective not to rely on the Internet for everything, but to communicate between sources of information and places to use. As a result, it is possible to reduce the risk of low delay, information leakage, and unnecessary traffic for society. Construction of a communication infrastructure suitable for physical services is important not only from the quality of service but also from the viewpoint of social design.

Under this philosophy, with the aim of constructing an optimum communication infrastructure, we are working on collaborative research with a Japanese telecommunications operator NTT, and are working on researching the way of data processing in the carrier network.

Spatial information technology linking physical and cyber

In the service in the physical world, it is required that the person in charge of the service operation can understand the meaning of the instantaneously acquired information. Because most of information transferred to cyber world does not have all information on physical world, people need to complement it. This is a major factor that impedes speed and accuracy. Spatial information technology allows that information in the cyber world to be used quickly and accurately with physical service.

We position spatial information technology as a service infrastructure used in all operation processes, and we are promoting research and development. We are also convinced that VLSI technology is indispensable in this field as well as the sensing technology, the cryptographic technology for trust, and the communication processing technology described above.

Creating a “service chain” with VLSI engineers

To sustain affluent society, we have to realize Service Innovation based on the “service chain”. For that purpose, the intentional collaboration of various experts in the huge chain is the essential, and the experts have to share the “Future Vision” and play their role. Such Open-Innovation is so difficult that here are few successful cases. To turn this situation around and create a new future value, VLSI technology is the most valuable technology to make our plentiful future. We will make intentional collaboration with respect to VLSI technology and experts. And we continue to provide services for secure life to ever-changing society under the vision of “ANSHIN Platform”.

References