

CC-Link Partner Association

Global Activity Report

Vol.6

CC-Link Partner Association 15th anniversary

Pursuing global standard network compliant with standards

Automation Technology : the Key to Enhancing the Shenzhen FPD Industry

Preventative Medicine New Applications for CC-Link/CC-Link IE

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R-IN Engine and CC-Link IE for utilizing IoT / M2M

Celebrating the 15th anniversary of the CC-Link Partner Association Pursuing global standard network compliant with standards

The CC-Link Partner Association (CLPA), which promotes the widespread usage of CC-Link, will celebrate the 15th anniversary of its founding in November 2015. CLPA has been consistently pursuing "globalization" for the past 15 years. CC-Link originated in Japan and has been consistently oriented towards globalization, increasing its presence in Asia and throughout the world. Currently, CLPA focal points are located in 9 countries and regions including Japan, and products adopting CC-Link have exceeded 1,400. With the milestone of 15 years as the occasion, CLPA will further accelerate its global expansion.

Although it is now hard to believe, CC-Link used to be a semi-open network when it was originally developed in 1996. However, as the number of connected nodes increased, the value of the network enhanced exponentially. It was therefore decided to open the specifications of CC-Link fully and to work toward its widespread acceptance as a network not dependent on vendors. Thus, the CLPA was established in November 2000.

This was when the emerging economies were beginning to gain attention. With manufacturing industries transferring their factories to China one after another, full-fledged promotion activities at the global level were impossible when limited to Japan and the developed countries. Thus in April 2001, 6 months after its establishment, CLPA opened branches in 6 countries and regions including China, Korea, Taiwan and ASEAN in addition to

● CC-Link Partner Association, 15-Year History Since Establishment

Date	Item	Information
Nov. 2000	CC-Link Partner Association is established	Established by 6 Foundation Partner companies
Apr. 2001	Branches are established at 6 overseas focal points.	North America, Europe, China, Taiwan, South Korea, ASEAN
May-01	SEMI Standards acquired	International standards for semiconductor manufacturing equipment are acquired
Dec. 2005	China National Standards GB / Z acquired	Boost to dissemination activities in China
Oct. 2007	CC-Link IE Controller specification announced	Promotes Ethernet-based network
Dec. 2007	CC-Link acquires IEC standards	As standard industrial field network
Mar. 2008	CLPA membership exceeds 1,000 companies	Partners outside of Japan account for 60% or more
Apr. 2009	Cognex joins the Board	Globalization also begins in the Board organization
Nov. 2009	CC-Link IE Field specifications announced	Ethernet-based field network
Apr. 2010	3M joins the Board	Global giant in the cable/connector field joins
Apr. 2011	Specifications released for CC-Link IE Field safety communication function	Equipped with a function that prioritizes processing of safety-related communication
Oct. 2012	SERT joins the Board	Strengthens the incorporation of needs in the Chinese market
Oct. 2012	India branch opens	Responds to the manufacturing industry's advance to India
Oct. 2012	Specifications released for energy management communication function	Enables sophisticated energy monitoring
Oct. 2013	BALUFF joins the Board	Promotes enhanced sensor lineups
Oct. 2013	CLPA membership exceeds 2,000 companies	Number of members doubles in 5 years
Mar. 2014	Turkey branch opens	Dissemination activities take place in Turkey, which is aiming at enhanced mechanical industry
Apr. 2014	Fumihiko Kimura appointed as new Chairman	Japan's leading expert in production system engineering and CAD / CAM
Aug. 2014	CC-Link IE acquires IEC standards	CC-Link IE acquires industrial network standards
Oct. 2014	MOLEX joins the Board	Leading connector manufacturer joins
May-15	Cisco joins the Board	Technological enhancement of the industrial IoT field
2015 (Planned)	Thailand and Mexico branch opens	The 9th and 10th overseas branch

Europe and the United States.

By swiftly focusing on and establishing focal points in rapidly growing Asia, CC-Link rode the wave of Asia's emergence to ensure its spread on a global level. By 2003, overseas members accounted for a majority within CLPA, and CLPA activities had shifted their focus to the global level

in just a few years after establishment.

Elsewhere, CLPA has promoted compliance with international and local standards for the sake of globalization. Starting with the SEMI Standard in May 2001, various standards and ISO/IEC certifications have been acquired. Compliance with national standards in

■ Branch Managers' Future Strategy



CLPA-Korea Director
JEONG Deog-Young

There is increasingly widespread consideration and application of CC-Link IE as the standard network for new facilities in fields including electronics and automobiles. We plan to carry out product advertising support through catalogs and exhibitions as well as holding monthly seminars for the introduction of product development methods.



CLPA-America Director
Robert Miller

CC-Link is recognized as a network which includes all the functions required of industrial Ethernet by the manufacturing industry. Using the "Gateway to Asia" campaign, our policy is to push hard for Asian expansion on the part of our US partner members.



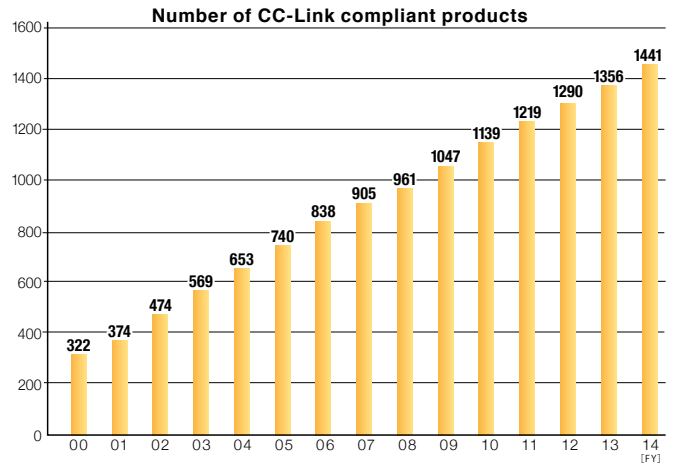
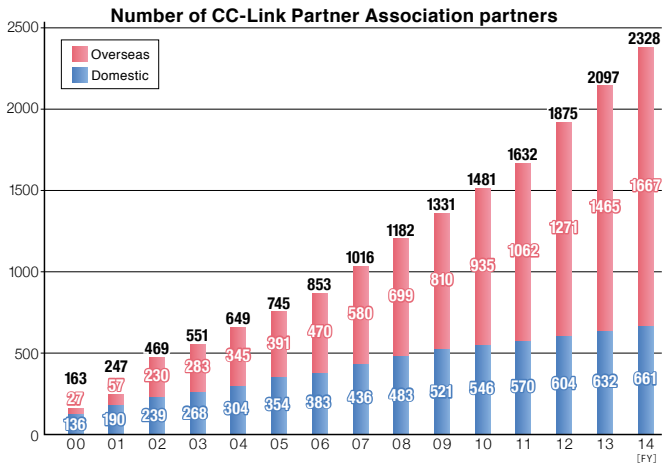
CLPA-Taiwan Deputy Director
Cheng-Chung Tsai

Networks easy to set are in demand in Taiwan's manufacturing industry, and CC-Link, with its diverse development methods, is well rated. We plan to proceed with support for manufacturers developing compliant products as well as with promotion to users.



CLPA-Europe General Manager
John Browett

European industry is focussed on improving future manufacturing operations by implementing the principles of Industry 4.0. A key requirement for this is network bandwidth. As the only open gigabit Ethernet available, CC-Link IE is the best choice to support this demand



China, South Korea and the like has also helped to establish an environment promoting implementation.

However, when it comes to the biggest topic for CC-Link in terms of compliance with standards, that would be the announcement of "CC-Link IE" in 2007.

Capturing the World of Ethernet

As a part of the CC-Link Family, the emergence of CC-Link IE incorporating Ethernet technology dictated the flow of opening and globalization of CC-Link. The use of Ethernet, the de facto in the computer network field, as a base has allowed the CC-Link Family information combination to cover not only production sites but the entire manufacturing industry, including management departments in the office. Other factors that further promoted

globalization were that general-purpose products became usable for physical parts such as cables and connectors and that necessities for maintenance became available anywhere.

Thereafter, functions have continued to expand, with CC-Link IE at the core. In particular, it can be said that the safety communication function and motion function achieved in 2011 were iconic among function enhancements. Safety communication prioritizing safety-related control information and motion functions absorbing delay in multi-axis control had been considered achievable only in a closed-technology dedicated network; they became possible as well in the open, Ethernet-based CC-Link IE. CC-Link IE acquired standards such as ISO and IEC one after another, further establishing its

superiority.

CLPA members reached 2,328 companies in 40 countries by March 2015, and the US-based Cisco joined the Board (made up of central companies with management roles) in April 2015, giving the organization greater variety. Global focal points span 9 countries and regions including Japan, with a Thailand and Mexico branch to be established in the near future as the 10th and 11th focal point. The globalization of the CC-Link Family and CLPA will most definitely continue its progress.



CLPA-China Director
Zhang Rong

Based on the government initiative of "Made in China 2025", interest in industrial Ethernet is sharply increasing. We plan promotions including participation in major exhibitions, information development on social media, co-production of road shows with major media etc.



CLPA-ASEAN
Andrew Shen

Given the background of rising labor costs, the ASEAN robot market is predicted to double within the next three years. We plan promotions focusing on CC-Link features highly evaluated by the ASEAN manufacturing industry, including reduced wiring and broadband.



CLPA-India Chairman
Sunil Mehta

We plan PR activities in mid-sized cities, such as holding seminars in Coimbatore, heartland of the textile. We will also conduct seminars for automobile industries in 2015. Our policy also extends to establishing the brand with future engineers through collaboration with universities etc.



CLPA-Turkey Country manager
Tolga Bizel

CC-Link has become even more widely known due to the use of CC-Link IE for the Marmaray project, building a rail tunnel under Turkey's Bosphorus Strait. We plan to work toward wider acceptance in areas including machinery industry, automobiles, and public investment.

Automation Technology: the Key to Enhancing the Shenzhen FPD Industry Medium to small-sized manufacturers face the issue of production management in their rapid development

Shenzhen is known as a leading area in China's flat panel display (FPD) industry. We asked Xie Zhengcai, Secretary-General of the Shenzhen Flat Panel Display Industry Association (SDIA), an organization of related corporations, to discuss the latest trends in China's FPD industry. The interviewers were Naomi Nakamura, Global Director of the CC-Link Partner Association (CLPA), which promotes the widespread adoption of industrial open networks CC-Link and CC-Link IE, and CLPA Director of Technology Haruyuki Otani.

Nakamura Tell us about the role of the SDIA.

Xie The Shenzhen Flat Panel Display Industry Association, which was established in 2005, currently has about 750 FPD-related manufacturers in its membership. Members include not only manufacturers from the Huanan region, which includes Shenzhen, but also from other regions of China and from overseas, allowing us to act as a unified contact point for the industry. The Shenzhen area is noted for the large number of small- and medium-sized FPD manufacturers there. In order to increase industry vigor, it is also our role to support them. For example, we help small- and medium-sized manufacturers build supply chains, and introduce to them the technologies that increase their productivity and quality so as to allow them to compete with major companies.

In fact, one of our essential technologies for the increase of productivity and quality is automation. Naturally, we are familiar with CC-Link and CC-Link IE as well. They are widely used by major manufacturers like Foxconn, I believe.

Otani Because of their high performance, CC-Link and CC-Link IE tend to be considered industrial networks for large-scale manufacturers, but that is by no means their only role. The increase of productivity and quality is an issue common to the manufacturing industry as a whole, regardless of company scale. There are, in fact, quite a number of small- and medium-sized manufacturers who have introduced



CC-Link and CC-Link IE. Many examples of its significant effect are available.

Xie Small- and medium-sized manufacturers in Shenzhen have not been oblivious to productivity and quality until now. The reality is that, while wanting to increase their productivity and quality, they did not know how to go about it. The industry is in need of technology that will increase productivity and quality.

Otani The Ethernet-based CC-Link IE has been widely adopted across the Asian region, including the BOE Technology Group, China's largest FPD manufacturer. We have many partners in China to whom we provide solutions using CC-Link IE as well. Setting up liquid crystal display production lines using CC-Link and CC-Link IE should be quick and easy. Because

it can be constructed with general-use devices, quick response to line expansion is also possible. This kind of easy handling should be popular among small- and medium-sized manufacturers, I feel.

Xie Wherever they are, small- and medium-sized manufacturers hope to mature into major companies. However, no matter how quickly they develop, if their methods are the same as those used when they were smaller, they will eventually hit a wall. They need to increase competitiveness while changing their manufacturing system rapidly in accordance with their development.

Nakamura CC-Link and CC-Link IE maintain the No. 1 share among industrial open networks, not only in Japan but in the whole of Asia. We feel that this is



Shenzhen Flat Panel Display
Industry Association Secretary-General

Xie Zhengcai

due to positive assessment of their easy construction. In particular, the existence of CC-Link IE is notable at FPD production sites. The fact is, CC-Link IE was originally developed with FPD manufacturers' production sites in mind. As the glass substrates used for FPD production become larger, the amount of data handled on site is increasing astronomically. In accordance with this, broadband networks that can handle these large-capacity data transfers are now required. CC-Link IE was developed with responding to these demands in mind. This is why it has been widely adopted in the FPD industry.

"The purpose of automation is not reducing personnel costs but leveling"

Xie At the moment, manufacturers in Shenzhen find that production management is not keeping up with their rapid development. This means that for many companies, while sales are increasing, profits are not keeping pace. More manufacturers are trying to use data to increase production efficiency, but many still don't even keep track of data to begin with. This situation has to be changed.

Of course, there are companies like Foxconn which picked up on the importance of production management at an early stage. We hope they will become the models, and that similar systems will



CC-Link Partner Association
Global Director

Naomi Nakamura

spread among small- and medium-sized companies over the next four to five years, boosting automation through the entire Shenzhen FPD industry.

Otani Automation is also an issue directly related to management. In order to hold out in the industry as personnel costs rise, automation is the only way. One might say that the background of the global success of the Korean FPD industry is that they automated using cutting-edge technology like CC-Link and CC-Link IE, working to increase productivity and quality.

On the other hand, reducing personnel costs is just one role of automation. Automation is not just a simple process of replacing people with machines in order to hold down costs. Its real purpose is the leveling of production through its daily major fluctuations. By keeping control of uneven production through leveling, oversupply of facilities and inventory becomes unnecessary.

Xie I hope to educate manufacturers about the importance of leveling production through automation, and the advantages of stabilizing quality.

"Highly reliable quality, Made-in-Japan"

Nakamura Do take note as well that CC-Link and CC-Link IE are technologies originating in Japan, where quality is a major concern. For example, all CC-



CC-Link Partner Association
Director of Technology

Haruyuki Otani

Link and CC-Link IE products undergo rigorous testing. Mutual connectivity is of the highest importance when selecting networks. When a product boasting of its standard compliance can be used with some products but not others, users have trouble. CC-Link and CC-Link IE, requiring strict testing for standard approval, may seem daunting to product vendors, but they provide major benefits to users.

Xie For Shenzhen's manufacturers to take the next step toward becoming major companies, total automation of production is essential. For this purpose as well, we look to CC-Link and CC-Link IE technology. Shenzhen's FPD industry may seem to be thriving, but some of its companies have a sense of crisis to the effect that further development is going to be difficult. In actual fact, there is no future for the industry without greater adoption of cutting-edge technology. With the help of the CC-Link Partner Association and others like it leading the way to widespread adoption of cutting-edge technologies like CC-Link and CC-Link IE, I hope to offer support to Shenzhen's FPD manufacturers.

Nakamura We look forward to lending a hand in any way we can. We plan to continue actively making information available through the Shenzhen Display Association. Thank you very much for your time.

Robots Usher In New Possibilities in Preventative Medicine Towards New Applications for CC-Link/CC-Link IE

A robot with great promise for application development, not just in the factory, but in areas as diverse as the community and the home. The advanced control functions provided by CC-Link/CC-Link IE should be very helpful in that evolution. The Global Director of the CC-Link Partner Association (CLPA), Naomi Nakamura, interviewed Akiyoshi Kabe, who is a CLPA technical advisor and professor in the Graduate School of Human Sciences at Waseda University, currently engaged in the research and development of medical care and welfare robots. She also interviewed the actress Maiko Ito, who is a graduate student from his laboratory, and is currently doing research on robots which can be usefully employed for things such as preventative medicine.

Nakamura Please explain about your specialization in Health and Welfare Industrial Science.

Kabe One of the major projects of Health and Welfare Industrial Science is the development of health and welfare robots. We are aiming to make a real contribution to solving the variety of problems which are now emerging in our super-aged society, by developing robots which can provide the different kinds of support that we associate with health and health care, in the many different scenarios that people find themselves in day to day. Specifically, we are developing the kinds of robots which can prevent "locomotive syndrome", in which the risk of needing nursing care increases due to the functional decline in the joints and muscles, and so on, that comes with aging. A significant feature of health and welfare science is not just developing robots, but simultaneously promoting research based on the premise of their "social implementation", developing an overall service which includes in its scope their actual operation on-site, for example, and even the business model to be employed.

A Fusion of Preventative Medicine and Robot Technology

Nakamura Ms. Ito, how did you become involved in Health and Welfare Industrial Science?

Ito So that I could study something useful about our super-aged society, I enrolled in the "e-School" of the Waseda University School of Human Sciences. In the e-School, you take part in a junior seminar. Just as I

was entering my third year and thinking about what seminar to do, my classmate told me about the most popular seminar, which was with Professor Kabe.

When I went to have an interview with Professor Kabe for the seminar, we talked about the possibility of perhaps doing something new by combining robot technology with the knowledge of preventative medicine that I had acquired, and it was decided that I could join his seminar.

Nakamura When it comes to the development of robots, I would have thought that knowledge other than preventative medicine is also required, such as mechanical systems and electronics.

Ito That's correct. Fresh engineering expertise is required in making a robot a reality, such as programming the microcomputer needed for controlling the mechanical system. We also undertook research and development which emphasized the robot concept itself, as well as, for example, the ways in which it can be utilized.

Nakamura Recently, the number of companies entering the field of health and welfare robots has been increasing.

Kabe Ten years ago, I think you would have seen hardly any health and welfare robots at robot-related exhibitions. However, as the need for care support robots has become clearly evident in our ever-aging society, a lot of universities and businesses have started to develop health care and welfare robots.

Working for a general electronics manufacturer, I was originally involved in the

development of control systems for industrial equipment and industrial networks. Both of these were principally aimed at factories, but with the expansion of robot applications, the range of application of the technology and networks has spread steadily.

The Need for Control Tailored to Humans

Nakamura Could you tell me about the robot that you developed?

Ito Our first robot was the Squat Support Tool Robot "SS RAM-chan". Legs and back must be exercised on a routine basis to avoid locomotive syndrome. The squat is an effective exercise for doing this. Except that, if the squat is not done in the correct way, conversely, you can end up injuring your knees, among other things. So "SS-RAM-chan" is what provides support so that you are able to do a squat with the correct posture.

The important point about your posture when doing a squat is the position of the knees. When bending your knees, they must



The "SS RAM-chan" squat support tool robot



Akiyoshi Kabe

Professor in the Faculty of Human Sciences of Waseda University

Professor in the Faculty of Human Sciences of Waseda University. Graduate of the Faculty of Engineering of Tokyo University. After developing FA equipment and industrial networks in the research and development division of a general electronics manufacturer handling industrial devices, he took up his current post in 2003. Engaged in research on "Human Science Robots" for use in the medical care and welfare fields. He also serves as a technical advisor for the CC-Link Partner Association.



Maiko Ito

Born in Nagoya, Aichi Prefecture in 1964. Actress. Won the first Miss Magazine Grand Prix in 1982, and debuted as a singer with "Binetsu Kana" in 1983. She remains active in television, film, and theater. She is now a board member of the NPO "Assembly for Tailor-Made Health Care". Graduating from Waseda University in 2014, she was admitted to the graduate school of Waseda University in April of the same year. Graduate School Studying robot engineering in the Graduate School of Human Sciences, she is currently developing a robot to prevent the onset of Locomotive Syndrome.

not end up further forward than your toes. At first glance, SS RAM-chan looks like a sheep puppet, but sensors are incorporated in it so that when you start to do a squat while facing it, a voice will tell you if the position of your knees ever comes forward of your toes. It is also equipped with a function to help you keep a constant rhythm during physical activity. This robot was exhibited at the "International Robot Exhibition" held in 2013.

Nakamura And what is the theme of your recent research?

Ito Right now, I am working on the development of a system to actively tackle the prevention of locomotive syndrome in people over 75 years of age. SS RAM-chan was developed to allow people who would like to prevent the syndrome to perform squats with the correct posture. However, in actual fact, there are not necessarily that many people who are actively trying to tackle the challenge of preventing locomotive syndrome.

Old people especially tend to be reluctant to do new things, or be physically active in any way. We thought that a support was needed which would allow as many people as possible to be more physically active. We are currently promoting discussion on the possibility of creating some kind of apparatus to be installed near an elderly person which would enhance their motivation.

Nakamura Surely the control of an application to support a person is even more complicated than controlling a machine. I imagine the type and amount of information required to grasp an actual situation also increase significantly.

Kabe Yes, that's right. The controlled objects in FA (Factory Automation) are mainly machines.

Since the motion of the apparatus does not change very quickly, it is easy to achieve control with good reproducibility. However, humans are constantly variable. That is the reason why a flexible control system will be required which can change accordingly. In particular, a complex process is required to make judgments based on information from living organisms. Here, I think that AI (Artificial Intelligence) technology will be required. In other words, we must contrive a way for the information system and the control system to work closely together.

Information System and High Affinity

Nakamura Characteristics of CC-Link/CC-Link IE are its strong record of adoption as a control system incorporated within industrial equipment, and its high affinity with information systems due to standards based on Ethernet technology. Moreover, data can be transferred at a high speed of 1Gbps. Perhaps we could make a contribution to the evolution of health care and welfare robots.

For example, when we are finally living in an age when the installation of robots in the home has become normal practice, a scheme must then be devised to carry out service and maintenance remotely. There are already examples of the operational state of equipment being monitored continuously using CC-Link IE, and "preventative maintenance" being performed to avoid failures before they actually happen. This kind of technology may be very useful in the

field of health care and welfare.

Kabe In fact, one health care and nursing robot developed in a laboratory has been installed in a hospital, and its effectiveness is being evaluated right now. Integrated control of this robot has been achieved using CC-Link; the automatic failure diagnosis function provided by CC-Link and a controller was extremely useful. If the robot started to malfunction, the problem could be ascertained very quickly, and appropriate measures taken swiftly.

By constructing a sensor network within the home utilizing CC-Link/CC-Link IE, various information can be efficiently collated. This technology may possibly be put to good use in finding solutions to the challenges Ms. Ito is facing at the moment.

Ito I certainly think so. We think that, in order to realize a mechanism which can increase the motivation of elderly people to be physically active, it is first necessary to understand the patterns in their lifestyles. Once we know this, we may be able to figure out where to install the appliance and how it should operate for an elderly person.

Kabe There are quite a few people in Japan who consider that FA is a technology for the factory. Overseas, it is widely recognized as a technology with potential beyond factories. As a matter of fact, there are also examples of businesses that specialize in FA which are currently developing equipment for hospitals. It appears that the CC-Link / CC-Link IE technology could possibly find a broad range of application outside the area of manufacturing plants.

"The combination of the R-IN Engine and CC-Link IE is ideal for utilizing IoT / M2M"

Renesas Electronics provides 1 Gbps-compliant industrial Ethernet communication LSI

While IoT / M2M, which allows autonomous control of devices, enables production efficiency in manufacturing, it also causes concern over bloated communication traffic. To deal with this issue, Renesas Electronics developed a solution based on both "performance enhancement of devices" and "broadband support". Akira Denda of Renesas Electronics states that a new engine for the former and CC-Link IE compliance for the latter can resolve this issue.



Akira Denda

Vice President, Head,
Industry & Appliance Business Division
2nd Solution Business Unit
Renesas Electronics Corporation

"Among the various contexts of IoT / M2M, nothing produces larger volumes of data than manufacturing facilities. This is because sensors arranged throughout the production line continue to collect data. While a vast amount of data enables more detailed analysis, it constitutes a large load on the processing infrastructure. The increased load on the network promotes delay and decrease in data quality, and increases the power consumption of the PLC that controls devices.

Given this background, we released the industrial Ethernet communication LSI "R-IN32M3 Series" in 2013. The main feature of R-IN32M3 Series is the "R-IN Engine" which turns a part of the real-time OS function into hardware in pursuit of

high-speed performance. By reducing the load to the CPU, a speed increase of 5 - 10 times the conventional speed has been achieved.

Resources vacated by the speed increase can be allotted to the device's primary processing of data. Since it uploads only the valid data after performing statistical processing of data and detection of bad data, rather than simply uploading all the raw data, the network bandwidth can be effectively utilized.

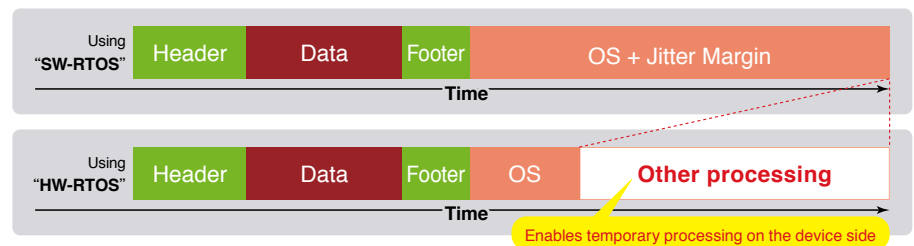
In keeping with the increased attention being paid to IoT / M2M, we have decided to ship the new LSI "R-IN32M4-CL2" in October 2015. Like the R-IN32M3 Series, it is equipped with the R-IN Engine, as well as having the new 1 Gbps PHY built in.

In the past, industrial Ethernet with 100 Mbps was thought to be sufficient. However, considering the growth of the environment in which IoT / M2M connect all devices, 100 Mbps will eventually be

insufficient. In addition to the R-IN Engine implemented to suppress the amount of communication data, we have also taken an approach to implementing broadband for the network itself.

Although R-IN32M4-CL2 is compliant with the same protocols as the R-IN32M3 Series, it is not an exaggeration to say that it is essentially intended for CC-Link IE. This is because the only industrial Ethernet that supports 1 Gbps broadband at the moment is CC-Link IE. To accommodate the development of IoT / M2M, we felt it necessary to actively support the broadband CC-Link IE.

We have organized the "R-IN Consortium" to support the development of products using the R-IN Engine, promoting collaboration among vendors. We are confident that R-IN32M4-CL2, which allows CC-Link IE to realize its features to the fullest, will be the core of the collaboration."



Allocating a part of the OS processing to the hardware produced



**CC-Link
Partner Association**

6F Ozone-front Building, 3-15-58, Ozone, Kita-ku, Nagoya 462-0825, Japan
Phone: +81-52-919-1588 Fax: +81-52-916-8655
E-mail: info@cc-link.org Web: http://www.cc-link.org