

# Intelligent System In the Age of IOT

## 物聯時代的智能系統特刊

(中英對照版 / Chinese and English parallel Version)

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COMPUTEX 2016 期間，UL 將於 6/3 在台北世貿一館 2F 會議室 5 舉辦論壇，全面聚焦潮流科技的安全隱憂，包括 IoT、快充、無線充電、數位製造、電路板、行動電源。誠摯邀請產業先進與會交流。



研討會報名

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## UL @ Computex 論壇 - 潮流科技安全不安全？

日期: 2016年6月3日 (星期五)

地點: 世貿一館 2F 會議室五

(台北市信義區信義路五段5號)

### 上午場

時 間	議 程
0915 - 0930	歡迎致詞
0930 - 1030	新潮科技引發的安全隱憂
1030 - 1120	新科技潮流的電路板 你注意了嗎?
1120 - 1130	中場休息
1130 - 1220	行動電源的安全隱憂

### 下午場

時 間	議 程
1330 - 1430	IoT 發展趨勢
1430 - 1445	中場休息
1445 - 1545	快速充電和無線充電的發展趨勢
1550 - 1630	UL 的數位製造全方位服務方案



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# Digital Signage Players for Smart City

## Real 4K 60P Video Playback Signage Solutions

### SI-313

- 3rd Gen. AMD Embedded R-series
- 3x HDMI 2.0 with H/W EDID emulation
- Supports 4K Video H/W Decode – H.264/265
- Segregated flow ventilation design



### SI-613

- 6th Gen. Intel® Core™ Desktop Processor
- 3x HDMI 2.0 with H/W EDID emulation
- Segregated flow ventilation design
- iSMART & iDOC remote control technologies



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## ARM-based Signage Solutions

### SA-101-N

- Freescale i.MX6 Dual/Quad Processor
- Supports Mini-HDMI(C-Type) output
- Ruggedized, fanless and compact design
- Digital signage S/W-ADplayer enabled



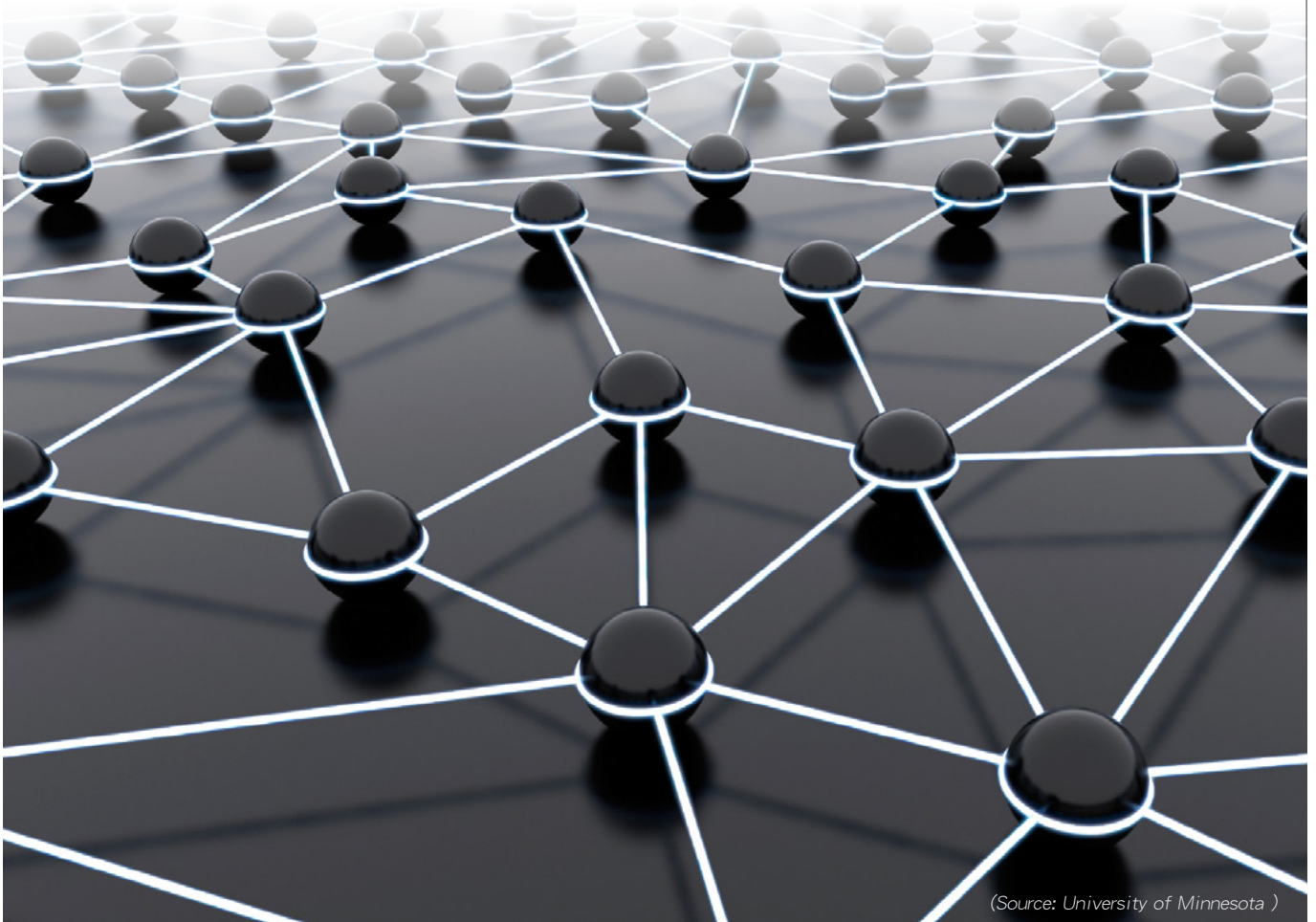
### SA-112-N

- Freescale i.MX6 Dual/Quad Processor
- Supports VGA/ HDMI (w/o HDCP) output
- Operating temperature from -40°C to 75°C
- Digital signage S/W-ADplayer enabled



# Sensor Technology Actualizes the Smart Lifestyle

Internet of Things (IoT) is considered the most important transformation in the IT industry in 10 years, and its influence will exceed that of the World Wide Web.



*(Source: University of Minnesota )*

The structure of IoT can be divided into the following layers, which include the first layer, sensor networks, the second layer, communications, the third layer, data storage and analysis, and the fourth layer, applications. When looking at this structure, the sensor group is the foundation of IoT, and the data retrieved by all types of sensors is collected to form enormous data bases for providing assistance in making back end decisions. Consequently, sensor technology is the first key to whether setting up IoT will be a success or a failure.

### The Multi-Axis Trend

In the IT market sensors are actually not a new technology. Not only has the technology matured for a long time but there has long been an wide scope of applications. STMicroelectronics Greater China and Southeast Asia MEMS and sensor components simulation General Manager Su Zhen-long pointed out that sensors are the front line of sensor networks. From the perspective of technology, motion detectors are currently the most common technology; whereas, sound detectors are still in the development phase. However, in the future, sound detectors have considerable potential for development.

Looking at the future trends of sensor technology, there are some common trends that both IoT and wearable devices will follow. The first trend is multi-axis systems. Sensor systems are moving in the direction of multi-axis development, and it is also an important trend in the sensor market. In actuality, the pace of multi-axis development for sensor systems has never stopped, and from the first generation of single-axis sensors to the evolution of 3 axis, 9 axis, 10 axis, 11 axis, and even the 12 axis sensor systems found today, multi-axis is an irreversible direction for development.

In the so-called “multi-axis” sensors what are the axes? Which axes are necessary? In general, tri-axial accelerometers, three axis gyroscopes, and three axis electronic compasses have already almost become the standard components for smart phones. These three sensors can be used to complete the vast majority of applications,

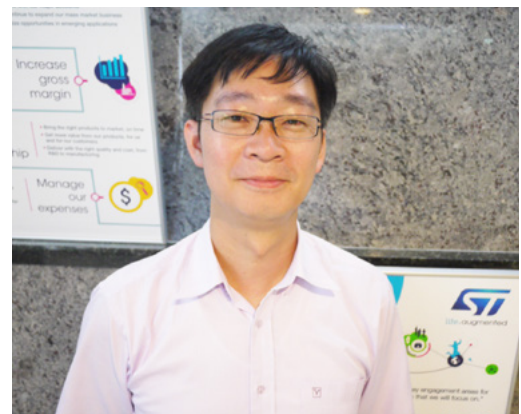
and they could even be called the “three axes” of sensing systems.

Sensors other than these three sensors, including altimeters, pressure gauges, thermometers, and light sensors, have gradually been incorporated into sensor systems and have become components of multi-axis sensors. Since multi-axis has become a definite trend, in the future more manufacturers will gradually research and develop sensor platforms with additional axes in order to meet the market requirements.

The expansion of sensors is only limited by quantity, and in the final analysis the major sensors such as accelerometers, gyroscopes, and electronic compasses are almost capable of satisfying the diverse applications environment. There will be more and more of these components, and in the future portable consumer cell phones will be complete sensor systems.

### Integration is Always an Issue

The second trend is high integration, and Su Zhen-long pointed out that integrated sensors are even more important for the raising of IoT and wearable devices. Since multi-axis is an important trend in sensor systems, the consequent integration work is another important issue. In as far as design engineers do not want to look at it, the various sensors are scattered about and located on every corner of the circuit boards. This not only increases the



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degree of difficulty for design, but also is not helpful for making light systems.

In the main programs pushed by large sensor manufacturers, other than single-axis sensors, modular sensors are the most common type. Multi-axis sensors can be integrated together through modular methods, and the majority will have the company's own processor or MCU added on.

ST is one example, and by its comprehensive solutions, this set of sensor systems was shipped out together to IoT and wearable device suppliers and equipment manufacturers.

Integrated modules could of course lessen many designers' troubles; however, from the standpoint of the trend towards lightness for mobile devices, it is still somewhat cumbersome to send out shipments of modular style devices. It looks as though through improved system level packaging, a single complete sensor system chip can be created, and this will be the necessary means of satisfying the requirement for highly integrated sensor systems.

After sensors became multi-axis, this meant that there would have to be multiple different sensor components within a single system. However, the scope of sensor components includes dabbling in many different types, from commonly found speedometers and gyro and magnetic compasses to pressure gauges, thermometers, light sensors, and even sensors that can detect sounds, flavors, and smells. Currently, the majority of manufacturers have a portion of these technologies; however, very few manufacturers produce broad and comprehensive sensor products.

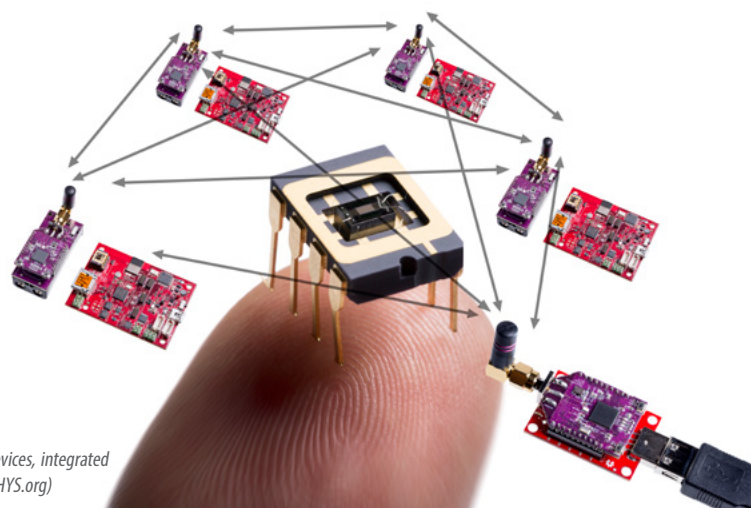
### Providing Complete Solutions

Not all manufacturers can single-handedly make all of the sensor components. Currently most use their own technology along with some technology purchased

outside; therefore, in multi-axis systems the most commonly encountered situation is where each has its own merits. In addition, the companies themselves already have products that they continue to use. As for technologies that they are not skilled with, the companies will collaborate with other companies in the market and integrate sensor components produced by other companies into the same sensor module in order to create a system.

Although this is a frequently encountered situation, people in the industry have different opinions about it. Because the chips are not produced by the same company, it is difficult to control the quality. Furthermore, in the semi-conductor industry, chip manufacturers emphasize having products handled by the same company from upstream to downstream, in order to master the quality on their own.

Taking a broad view of the future, self-sufficiency in sensor technology is the ultimate goal that all major sensor manufacturers are striving for, and regardless of whether they are conducting their own research and development or they are acquiring technology through mergers and acquisitions, after they have their own sensor technology, it is easy for them to create multi-axis sensor platforms with consistent quality. The point is that technological self-sufficiency has a multiplier effect on systems integration. ■



► With the raise of the IoT and wearable devices, integrated sensors is even more important. (Source: PHYS.org)

# iBase Gets Into the Digital Signage Market for Smart City

In its early stages of the digital signage industry, the main hardware providers were mainly from the industrial computer sector. The market was not large then and the specialized controllers were the hardware mainstream. Gradually, prices of the controller boards gradually slid and flat panel displays became popular, which supports the explosive growth that digital signage was experiencing.

As market demand changed and required new product features, industrial computer manufacturers as well as large consumer electronics companies started to invest resources in the development of digital signage systems and players. Eventually, the rapid increase of supply and similar specifications of products hurt profit margins of many companies in the market. Even this increasingly competitive market has suddenly become less attractive to some industrial computer companies.

However, this is not a blanket statement that can be applied to all manufacturers. In fact, IBASE has won a number of awards in the domain of digital signage with their high-quality products. Asia-Pacific Regional Vice President of Business Affairs, Roland Chen pointed out that IBASE's digital signage line has experienced extraordinary feedback from the market with a variety of designs especially in last two years.

## Emphasizing Its Own Brand – Using a Variety of Designs for Specific Applications

IBASE has created their own "IBASE" brand of digital signage to promote the products in the market and has introduced a variety of new technologies for different market segments. At the Computex Taipei 2016 they will showcase an easy-to-use signage stick based on ARM/



*Chen Zhang-tai pointed out that iBase's digital signage has experienced excellent results in the market layout with a variety of designs. (Photograph: MD Wang)*

Android that is only the size of a lighter. The signage stick features a Freescale i.MX6 CPU, mini HDMI, USB I/O interfaces in a cosmetically appealing compact PnP device. In addition, it has built-in video playback software that simultaneously play three pictures in a single FHD display. In the exhibition, IBASE also has a digital signage player designed for various high-end applications supporting 4K 60P with HDMI 2.0 extreme high-resolution.

Roland Chen further stated that the main reason the digital signage systems line is not taken seriously is similarity of the existing products with no significant differences. Although digital signage systems do have an open architecture, but if manufacturers do not highlight certain features for specific industries, the products would appear to be duplications and would engage the makers in inevitable price competition. However, taking the high-end product described above as an example, it has featured that sets it apart from the regular products such as low-level application oriented, low design costs quick installation, and fixed screen resolution. Moreover, the product automatically recognizes the time of Mini SD files and plays the most recently saved audio-visual files. This differentiates the product from others. Besides the hardware design and software technologies, IBASE supplies the free control software that enables users to remotely control the signage content to be played.

IBASE has invested a considerable effort in digital signage and created practical and innovative features as well as different designs specific to the applications targeted. For instance, to utilize the back flat spaces of panel displays, IBASE design its signage controller chassis suitable for flat installations. Aside from this, the interior structure of IBASE signage players make use of embedded designs in contrast with bulky designs of conventional systems.

Roland Chen explained that although the environment for digital signage applications is generally not in harsh industrial computer environments such as factories or in-vehicle, and that digital signage is still commonly found in commercial-grade applications, how digital signage systems are operated differs a lot from consumer electronics products. For example, digital signage must be operated for over twelve hours each day. Unlike consumer electronics, digital signage products are considered as corporate assets and are not replaced at will 2-3 years. Therefore, manufacturers must be able to provide parts and maintenance for a longer period of time.

Other than taking long-term supply of components into consideration, hardware providers must pinpoint the hardware design requirements needed for different environments. The location of the fan is of particular importance. For example, to meet the needs of applications with high audio-visual requirements, systems must not only have high levels of operating power and stability, they must be able to be reliable by effectively handling rise in temperatures inside the interior. Therefore, the fan becomes an indispensable component for heat dissipation.

*IBASE will showcase a signage stick that is only the size of a lighter.*





Nevertheless, in some locations where digital signage systems are set up, such as roadsides, there could be large amount of dust. It would be easy for the interior structure of the products to accumulate dust that would cause the devices to malfunction. In determining the position of the system fans, heat and dust are factors taken into consideration. The design for this type of structure must rely on a high degree of professional experience in order to create a suitable and effective product.

### **Professional Use Tablets – Attacking Specialized Application in IoT Market**

In addition to displaying digital signage systems, IBASE will showcase two types of handheld tablet computers - the IoT front-end tablet devices for specific vertical application of connecting to back-end cloud computing called "BIG DATA". Another one is a tablet computer designed for 3D viewing for educational purposes in the field of medical care.

In current surgery teaching practices, intern students usually observe operation taking place in the surgery room through a window. By using this tablet computer with transmissions over the Internet, intern students are now able to closely observe the surgical procedures with 3D viewing. Aside from the medical care uses, caretakers can scan patients' bracelets using the tablet computers to gather patients' medical care records.

The other item is a long distance RFID reader tablet computer that can be used in warehouse management. Roland Chen explained that this type of product has already been sold to government abroad for use in asset inventory management. Users can rapidly take inventory of assets by reading electronic tags attached to the equipment with the built-in tablet reader.

As digital signage technology matures, digital signage applications will become increasingly far-reaching. Roland Chen pointed out that from the technical point of view IoT is already a well-established trend, and the applications will expand even more. From the standpoint of applications, commercial digital signage will still account for the majority of the market; however, in high-end markets, industrial-grade machines will be the mainstream products. Nevertheless, regardless of whether they are for commercial or specialized professional use, Roland Chen believes that those differentiating themselves with embedded designs having custom specifications for specific market segments will have greater profitability.



*IBASE Garnered Anew COMPUTEX d&i awards 2016 with SI-613 3x 4K Digital Signage Player*

# Division of Labor to Create the Most Optimal IoT Platform

It is believed that the Internet of Things (IoT) is the third wave of the IT revolution and a continuation of the PC and World Wide Web. Unlike the first two, which had a large influence, but the influence was still limited to the IT domain, IoT will have substantial horizontal applications in other domains. In addition to the IT industry, people today are already experiencing it in all kinds of other industries which can all be brought into the domain of IoT applications.

With this in mind, there are huge opportunities for IoT, and according to projections made by Industrial Technology Research Institute (ITRI) IEK, the three major IoT business opportunities are in health care, smart management, and smart manufacturing, and they will blow up within the next five years. From an estimated US\$52.9 billion in 2015 to US\$133.2 billion in 2020, a compound annual growth rate of 20.3% is expected which will drive platform integration.



(Source: kerlink)

Taiwan is a key location for the IT industry; however, it has always primarily relied on hardware manufacturing. As a result, when faced with the IoT wave, the Taiwanese industry world is proceeding based on the mindset of hardware. Currently, the IoT produced by Taiwan's industries is mainly focused on low-level sensor network provisioning, including controllers and bridges. Because automation is deeply rooted in Taiwanese manufacturers in this domain, the next level of software design is based on their customers' technical expertise. Moreover, in order to avoid moving into their customers' niches, the IoT products made by Taiwan's automated factories usually have kept the line layout and not crossed over into software. Consequently, in the IoT industry ecosystem, the position of Taiwan's industry is still unclear.

The structure of IoT manufacturing and organization are different, and they are interpreted differently. However, there is still a basis for consensus. Usually they are divided into three levels, which include sensors, networks, and applications. The three levels of this structure all require communication networks and software links, management, and hardware equipment for operations at each level. Regardless of which level, in the current market the IoT software with larger scope is all provided by outside companies. This is the situation with the two

companies Parameter Science and Technology (PTC) and later National Instruments (NI). Both companies are deeply rooted in IoT, and PTC's IoT software includes development kits and total working platforms. In addition to the well known company in the industry LabVIEW, NI's flagship DIAdem platform is designed for data retrieval management.

### PTC Created an IoT Eco-Network

In the manufacturing domain PTC has always had their enterprise management software production platform as the company's core product, and it includes PLM, and CAD/CAM. Because IoT is also viewed as enterprise, especially as the future mainstream architecture for manufacturing industries, in addition to PTC's extending their own software platform and integrating into IoT, in recent years they are also strengthening the company layout through mergers and acquisitions.

PTC APAC Technical Sales Senior Director Falcon Uang states that IoT covers a huge area, including low-level automated embedded equipment, network systems, systems integration, database analysis, and vertical industry solutions. There is no way for one manufacturer to provide services for all of the software and hardware products. Therefore, this industry must work together with partners in a variety of different domains in order to have the capacity provide users with perfect solutions.

Nevertheless, IoT coverage is greater than broadband coverage, which makes it difficult for manufacturers in different domains to find suitable matching objects when they are developing products. Even if they find them, the interfaces for both parties' products will require running adjustments. Falcon Uang pointed out that PTC's flagship ThingWorx platform can solve the above mentioned problems in dealing with this issue in order to bring the products to market.



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## ThinkWorx Joins Hands with Axeda

ThingWorx's goal is to create a complete IoT ecosystem platform that companies at each level of the IoT structure can use to research and develop tools and products. This method has two advantages. The first is that manufacturers can directly browse using this platform and search for matching companies. Then each manufacturer's products will be based on this platform's design.

Therefore using this platform to search for manufacturers to collaborate with enables both parties to have seamless compatibility and significantly shorten the times needed to adjust the interface. This assists the companies to quickly bring their products to market. Falcon Uang also stated that the IoT era emphasizes fast time to market, and with this demand, the time period spent designing products will also drastically decrease. ThingWorx firmware has considerable flexibility, and this can help manufacturers to rapidly develop applications.

In addition to ThingWorx, in 2014 PTC also acquired another connector and cloud sensor solutions developer called Axeda. Falcon Uang pointed out that Axeda has over 150 clients, and every day they handle tens of millions of pieces of information across multiple industries.



▲ NI Marketing Manager Wu Wei-han pointed out that DIAdem is capable of defining different sources of information and then carrying out analyses. (photo / NI)

Their diverse collaborative partners include leading mobile networking companies, device manufacturers, and systems integrators and enterprise systems analyzers.

Axeda's current structure provides cutting-edge IoT technology and assists in the collection and handling of mechanical and sensor data. Axeda's software sets up secure networks for companies and carries out remote monitoring. They also provide management and services for all types of connectors, sensors, and devices. Falcon Uang also stated that Axeda's technology products are compatible with ThingWorx's rapid development applications platform and their already existing service lifecycle management (SLM) and product lifecycle management (PLM) solutions products. Axeda's strength in IoT connections and device management is integrating ThingWorx's rapid development applications tools to enable PTC's IoT structure to be more abundant.

## NI Begins with Industrials IoT

In contrast to PTC's method, another company with software that is well known to outside industries, NI has used an automated production line end layout to strengthen their establishment of IoT software. NI sales manager Wu Wei-han pointed out that NI's automated domain's platform is growing, and their hardware includes a variety of standard architectures, such as PXI and CompacRIO. NI's primary software is LabVIEW, and their initial platform was mainly testing, but they later extended to the design side.

Wu Wei-han pointed out that the current shape of IoT involves several types of industries, and in the future they will all comprise the main frames of business operations. Currently there are already several structures appearing such as the Internet of Clothing, Internet of Vehicles, and Industrial IoT. Among these, Industrial IoT and Industry 4.0 match the concept of new generation smart factories; therefore, they are viewed as the pioneering sub-structure of IoT.

In recent years the mode of consumer products has shifted from large quantities of a few types of products to large quantities of many types. However, the traditional manufacturing methods are not able to handle this situation, and the more flexible Industrial Internet of Things (IIOT) has already become the mainstream factory structure of the future. In comparison with traditional manufacturing methods, IIOT is more flexible, and when faced with having to produce diverse types of products, the parameters can be quickly adjusted to meet the requirements of different orders. Interconnected communication can also be set up between devices in order to realize the vision of smart production.

Wu We-han also pointed out that the IIOT of the future will definitely arrange large numbers of sensors for each apparatus and even each product, and the information that these sensors send back will accumulate enormous amounts of information, and this will become Big Data. In addition to being able to be used to make accurate analyses, it will also lead to information handling challenges for companies.

Aimed at Big Data, NI's DIAdem platform can conduct rapid searching, loading, rendering and measurement of data analysis to create relevant reports. The DIAdem is designed for the current testing environment, and it can store and process numerous custom formats of Big Data. Furthermore, the reports that it produces can provide effective information to facilitate decision-making.

### **DIAdem Facilitates Decision-Making**

Wu Wei-han pointed out that DIAdem is capable of defining different sources of information and then carrying out analyses. He took the Land Rover automobile manufacturer as an example. The company entered into automated manufacturing at a relatively early stage, and they set up large amounts of sensors to collect information. Each day these sensors sent back as much as 500GB of data, which far exceeded the amount of data that the

platform could handle. Consequently, each day they could only analyze approximately 10% of the data. After the company adopted DIAdem the amount of data analyzed shot up to 95%. It was an increase in the amount of data processing and a reduction in the amount of time needed for repeated testing due to insufficient data, which had been a problem in the past. In addition, DIAdem and NI are also integrated with another data capture software, called InsightCM, which is a complete platform for data acquisition and analysis.

As IoT software manufacturers, PTC and NI both have structural strengths and have a solid mutual collaborative relationship. For instance at the 2005 NI Weeks, PTC exhibited related cases done in collaboration with NI. This proves that in comparison to technology in the past, when the dominant trend was one of single companies, and compared to other technologies and other architectures, IoT places greater emphasis on division of labor. All of the companies in the supply chains must form a chain of tight junctions in order to create the most optimal IoT systems. ■