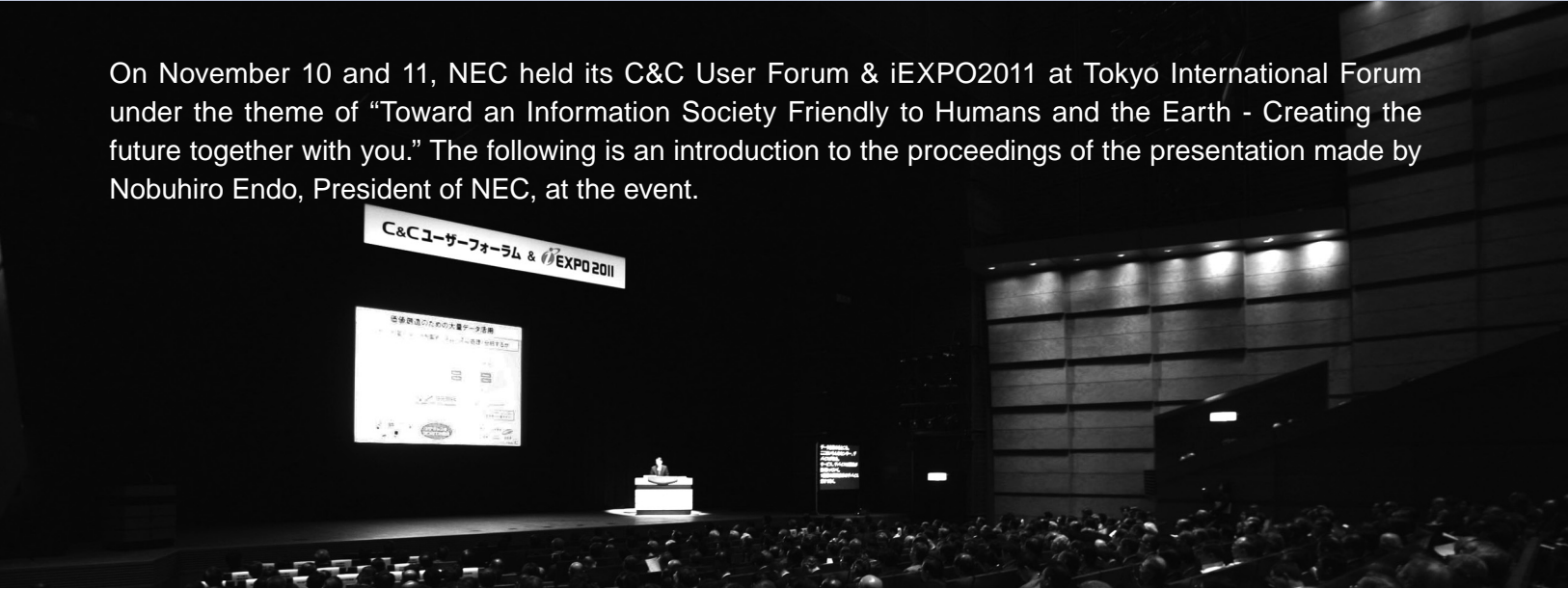


C&C User Forum & iEXPO2011 – NEC Presentation

Toward an Information Society Friendly to Humans and the Earth -Creating the future together with you -

On November 10 and 11, NEC held its C&C User Forum & iEXPO2011 at Tokyo International Forum under the theme of “Toward an Information Society Friendly to Humans and the Earth - Creating the future together with you.” The following is an introduction to the proceedings of the presentation made by Nobuhiro Endo, President of NEC, at the event.



Nobuhiro Endo
President and Representative Director
NEC Corporation

An Information Society Friendly to Humans and the Earth

Today, based on the theme of “Toward an Information Society Friendly to Humans and the Earth - Creating the future together with you,” I would like to introduce you to the types of areas in which NEC is capable of contributing to both its customers and society.

The NEC Group Vision 2017 is “To be a leading global company leveraging the power of innovation to realize an information society friendly to humans and the earth.” In 2007, employees across the entire NEC Group set out to carefully consider and formulate this vision, which represents what we envision as a company to achieve in 10 years.

The year 2007 marked the 30th anniversary of the C&C declaration made by Dr. Koji Kobayashi, former chairman of NEC, at INTELCOM '77. This led us to call for the creation of a prosperous information society through the integration of IT platforms and networks, which is today's equivalent of C&C - the integration of computers and communications technologies.

This “prosperous information society” I just referred to is actually expressed as “an information society friendly to humans and the earth” in the NEC Group Vision 2017. By this we mean a society in which individuals are able to not only freely access information whenever and wherever they are but also use convenient solutions in real-time. Moreover, the society we envision is one in which impact on the global environment can be reduced for all human activities. This “society friendly to humans and the earth” is exactly what our company is striving to realize.

While the world's population recently surpassed the seven billion mark, the amount of water, food and resources available to create industrial products is limited. How can we effectively utilize limited resources like these, and how can they be used to enrich peoples' lives? These are current social issues shared by us as a company, and overcoming major problems like these will require us to communicate more broadly and closely. Amidst

* This manuscript is an excerpt from the NEC presentation given at the C&C User Forum & iEXPO2011 on November 10, 2011.

these issues, it will be imperative for us to collect a variety of information, keep abreast of changes and provide our customers with useful services.

Ever since the establishment of our company, NEC has focused on the evolution of computers and communications - defined as C&C by Dr. Kobayashi - That is, we have concentrated on to evolution of IT platform and a network. Today, the term C&C has been replaced by C&C Cloud, and we are setting our sights on achieving growth in our C&C Cloud business. The “information society friendly to humans and the earth” we are endeavoring to realize through C&C Cloud is one in which a vast array of information can be used to create useful services that anyone can freely access from virtually anywhere. What’s more, C&C Cloud will make real-time and dynamic use of these services possible.

IT platforms and networks are the biggest components supporting cloud computing, and both have undergone tremendous innovation over the past ten to twenty years. In particular, the shift to wireless broadband networks has proven to be extremely useful in enabling individuals to access information and enjoy services offered by providers from literally anywhere.

Meanwhile, in the area of computing, improvements in fundamental processing capabilities and virtualization technologies have made more efficient use of hardware possible. These improvements in computing performance and the shift to broadband communications have led to the creation of cloud infrastructure, which has in turn enabled the realization of services such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).

Cloud is comprised of three components: IT platforms and networks, which are at the core of cloud computing, the services existing on those platforms and the sensors and devices necessary for providing data to the cloud and actually being able to use cloud services. NEC possesses all three of these components as assets, and is therefore able to combine them to create various end-to-end cloud solutions.

The Value of Cloud

The digitalization of information has proven to be the biggest factor in generating value through cloud. By accumulating

information that was once only available on paper as data, that data can be linked with other data from different categories to create new value. For example, linking traffic and automobile information makes it possible to predict the possibility of traffic accidents. Then, by adding precipitation information, you could potentially reduce the occurrence of such accidents. This could also lead to a decrease in the number of times drivers hit their brakes, thereby reducing fuel consumption. As you can see, the simple act of linking various types of information can lead to the creation of unprecedented services. This is what the world of cloud is all about.

When it comes to cloud services, “real-time” and “dynamic” are the most important keywords. This is because real-time collection of data and the ability to dynamically respond and provide services to users can lead to the creation of new value.

Since cloud makes it possible to handle large quantities of information, comparisons with data accumulated in the past could potentially help us make near-future predictions, which would in turn lead to prevention and support for preventive actions. In addition, wireless networks will make it possible to use such services from virtually anywhere. “Real-time,” “dynamic,” “prediction,” “prevention” and “services that can be used anywhere” are the five keywords and phrases in the field of cloud. Going forward, it is anticipated that a wide range of services will be created to realize the value of these aspects of cloud.

The Challenge of “Big Data” and NEC’s Initiatives

Recently we’ve been hearing a lot about “Big Data.” The use of valuable cloud-based services will require the handling of large quantities of data. For example, in September 2010, smartphones accounted for 3% of all mobile phones used in Japan, while that percentage rose to approximately 15% in September 2011. Although that is only a 12% increase over the course of a year, mobile data traffic more than doubled during that time.

It will therefore become vital to possess the computing power necessary to respond to significant increases in the amount of data handled as a result of the use of convenient services. Increases in data size from greater use of rich content, increases

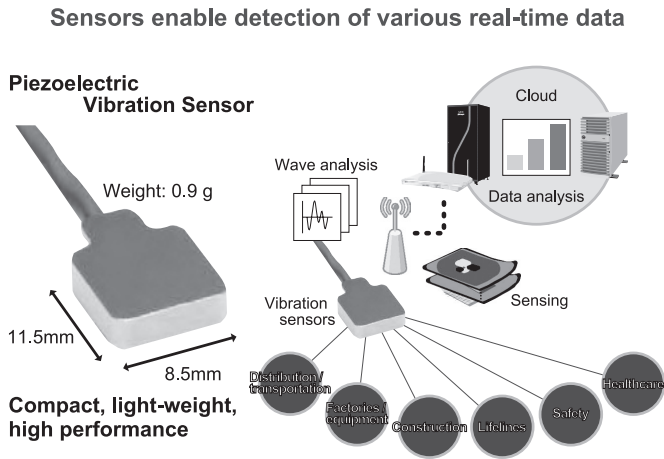


Fig. 1 Collection of real-time data /
Advanced sensor technology

in data sources from diversification of devices and real-time data conversion of real-world event information are all contributing to the rapid rise in data volume.

Real-time data collection, data traffic processing and data analysis for value creation will all be integral to the utilization of large quantities of data.

First, in terms of data collection, data collected in the cloud is not only limited to that gathered from mobile phones and other terminals but also includes sensor data for gathering physical information. Take, for example, the recently developed Piezoelectric Vibration Sensor (Fig. 1). The collection of large quantities of data requires compact, light-weight and high-performance sensors. This newly developed compact sensor achieves high sensitivity and broad frequencies, thereby enabling it to gather data that has up until now been impossible to detect. For instance, since this sensor is capable of detecting everything from extremely slow vibrations to delicate, high-frequency creaking in buildings, it can be used to recognize the signs of water or gas leaks.

Next, it will be necessary to determine how we can efficiently transmit collected data through networks. This is what spurred NEC to develop a new network product called Programmable Flow. This is the first product in the world to incorporate OpenFlow technology, and has won awards at events such as Interop in both the U.S. and Japan. Programmable Flow is

Building efficient networks by OpenFlow

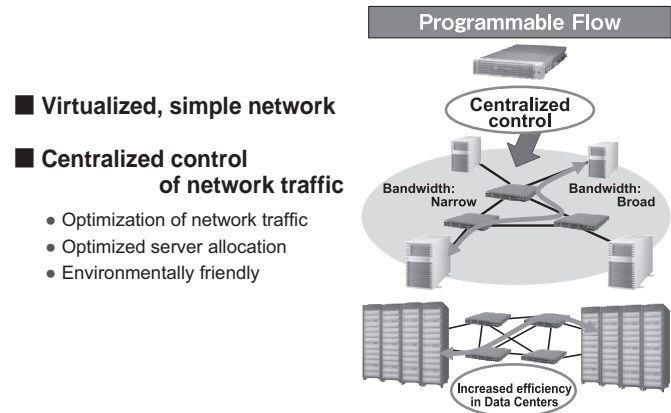


Fig. 2 Data traffic control /
Efficient network operations

able to determine which routing is best based on data content. This eliminates network congestion and makes it possible to effectively use network paths according to the type of data even when faced with large quantities of data (Fig. 2). It is also necessary to consider how to process collected data. NEC is currently researching ways in which it can process data collected in real-time to most efficiently provide services. First, data is accumulated until a certain amount of past data exists, at which point “machine learning,” a technology with which the computer itself is able to recognize the attributes of the data and determine what correlations exist between data possessing particular attributes, can be used. Then, once the computer has created rules based on these correlations, it is able to apply those rules to current real-time data, thereby making it possible to predict future occurrences.

The key to analyzing large quantities of data and creating useful services will be the ability to discover correlations between past data and current conditions.

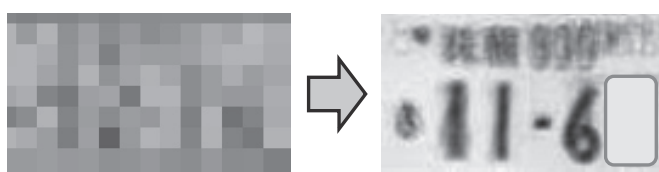
For instance, NEC possesses “super-resolution technologies” with which blurry images can be transformed into clearly visible images. Using this technology, even images that were once unrecognizable as images due to the absence of sufficient image data can now be made clearly visible by providing rules through machine learning (Fig. 3).

Then there is our face recognition system, which can be used

Large-scale video monitoring systems using super-resolution technologies

■ Learning-based analysis technologies enable recognition of low-resolution images that could not be recognized using conventional technologies

Contributes to the improvement of visibility of number plates and human subjects in wide-area and distant video surveillance



Before

After

※ Learning effects have been confirmed using images of license plates and human faces

Fig. 3 Data analysis for new value creation / Advanced analysis algorithms

to recognize human facial features, match those features with large quantities of stored facial feature data and then verify the identity of the person in question. The key to this system is its ability to process large quantities of data while at the same time producing particular correlation results. Last year, NEC's face recognition system was ranked number one in evaluation tests for accuracy held by U.S. National Institute of Standards and Technology (NIST).

In May of last year, NEC unveiled its Cancer Diagnosis Assistance System “e-Pathologist” (Fig. 4). Pathologists visually examine endoscopically removed tissue samples under a microscope to determine the presence or absence of cancer and select the best course of treatment for patients diagnosed with cancer. The pathologists who make these pathological diagnoses must be highly skilled and experienced, and are subjected to a great deal of stress due to the fact that there is no room for misdiagnosis. That's where e-Pathologist comes in as a system that uses artificial intelligence technologies referred to as image processing and machine learning to assist in making pathological diagnoses.

NEC is committed to working together with you to determine what types of services will be useful from the five viewpoints I mentioned earlier of “real-time,” “dynamic,” “prediction,” “prevention” and “used anywhere,” and to move forward with the development of these services.

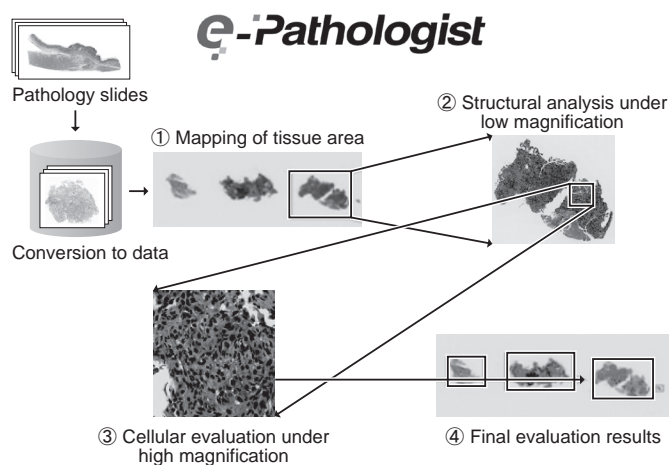


Fig. 4 Examples of advanced analysis algorithms

Smart Cities that are Friendly to Humans and the Earth

As I have shared with you thus far, the shift to broadband networks and improvement of IT platform performance are the first steps that must be taken toward the realization of cloud-based solutions. And it is only once services enabled by that foundation and devices and sensors capable of accessing the cloud have been developed that a single solution can be created.

Smart Cities have recently become a popular topic of conversation. Smart Cities are comprised of many layers, one of which is the energy resource layer. It is in this layer that NEC is promoting the development of new batteries, including those for household use. In early 2011, NEC formed a strategic partnership with Enel Distribuzione, Italy's leading electric power company, to move forward with the development of energy storage systems toward the realization of Smart Grids.

Each and every one of the examples I have introduced today are new cloud services utilizing Big Data. The major selling point for these services is the new value they create; that is, the ability to make predictions, support preventive actions based on those predictions and be used anywhere. Going forward, we at NEC hope to work together with all of you in creating new value, and look forward to your continued support. Thank you.

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Development of a Charge Controller for EV Charging Services

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Household Energy Storage System featuring Efficient Power Management and Environmental Compatibility

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NEC Presentation

Exhibition report

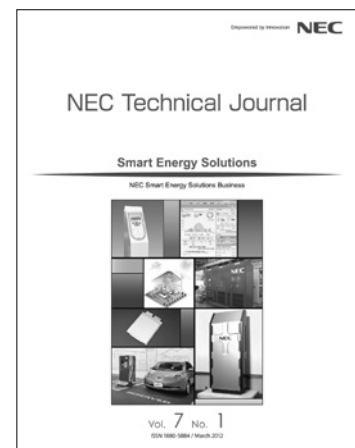
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March, 2012

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