NEC

NEC Vision
Case Studies and Highlights
2014

\Orchestrating a brighter world

NEC Vision
For Social Value Creation

NEC group is focusing its efforts on promoting the Solutions for Society Business by enhancing the social infrastructure that utilizes ICT (Information and Communications Technology) in order to ensure the safety, security, efficiency and equality of society and enable people to live abundant lives.

Addressing various social issues poses a great challenge for us. At the same time, we consider it a promising opportunity to rebuild social structures that achieve both customer value and social value.

Recently, NEC announced a new corporate key message, "Orchestrating a brighter world", under which NEC group companies will work as one entity to promote the solutions for society business.

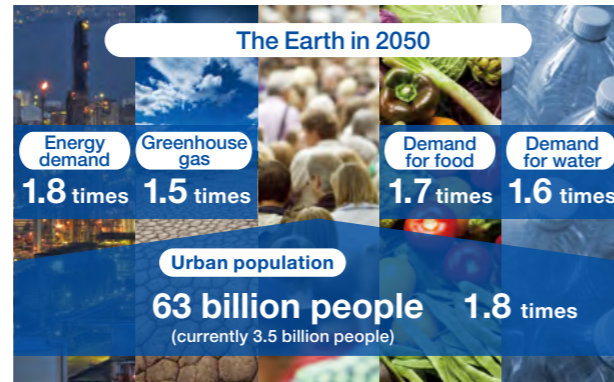In this booklet, we feature eight businesses as highlights of "Solutions for Society Business".

We have also issued a separate booklet titled "NEC Vision for Social Value Creation", which sets out our thinking on how ICT can contribute to society, business, and our daily life to achieve the goal of social value creation. We sincerely hope it will prove to be useful for you.

Making full use of ICT, NEC is committed to "Creating Social Values" through processes that solve various issues along with our customers and business partners.

Contents

Megatrends and NEC Vision for Social Value Creation

The Earth in 2050

Energy demand	Greenhouse gas		Demand for food	Demand for water
1.8 times	**1.5** times		**1.7** times	**1.6** times

Urban population

63 billion people **1.8** times
(currently 3.5 billion people)

(Source: Data from OECD, FAO, PwC, and the United Nations)

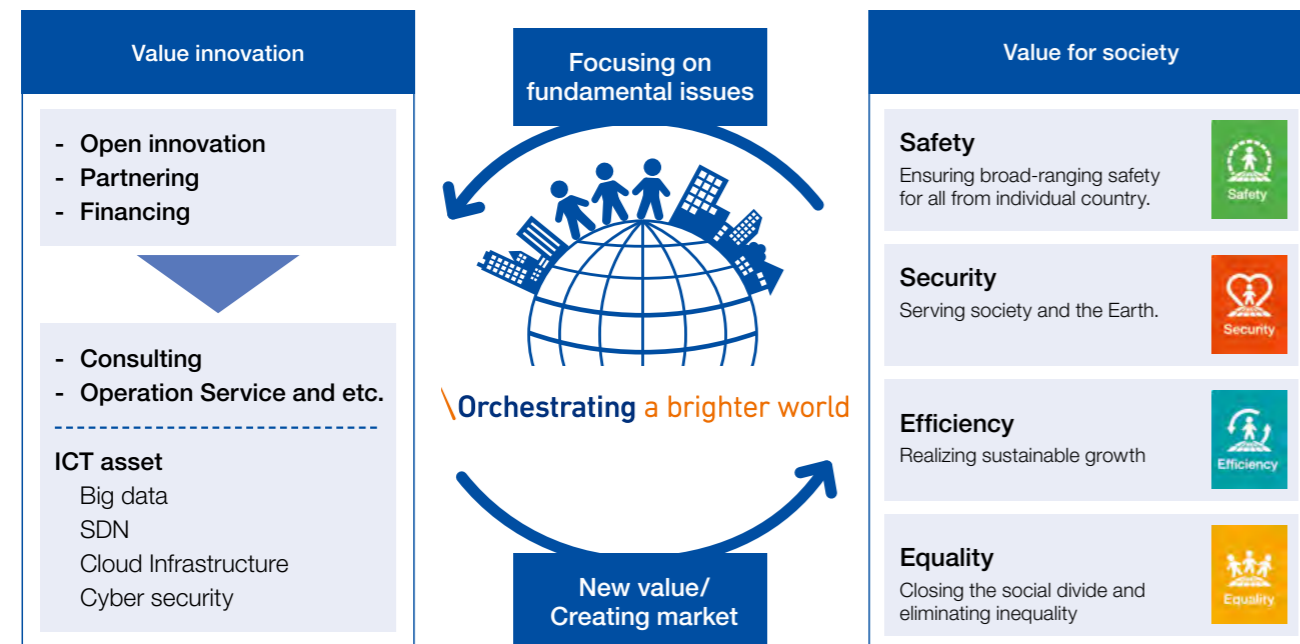## Drastic changes in global economy and society

Looking ahead to the year 2050, the global population is forecasted to increase from the current figure of 7 billion to 9 billion, and the urban population is expected to grow by 1.8 times to 6.3 billion. The shift to city living will boost demand for energy, food, water, and resources faster than population growth. To create a sustainable society, it is important to build a new social infrastructure that makes efficient use of resources while increasing production of resources. It is conceivable that contrivances and structures that transform our lifestyle will become necessary. There is a trend now that shows changes in G7-centric world politics and economics to a multipolar model that includes emerging countries. Along with the Internet penetration, information transmission and circulation on a personal level will become more active and go beyond national and regional barriers, increasing individual power and its influences.

Creation of Social Values through Problem Resolution

In line with these trends around the world, NEC is focusing its efforts on the provision of "solutions for society" through social infrastructure creation with ICT in order to ensure the safety, security, efficiency, and equality of society. In April 2013, NEC declared the transformation into a social value innovator in the Mid-term Management Plan 2015. By solving social issues, NEC aspires to satisfy both customer value and social value.

Co-creation of new Social Value

ICT cannot solve social issues by itself. The most important thing is the domain knowledge and know-hows of the users who use the services.

Collaboration with NGOs, NPOs, and local municipalities who comprehend the issues the local society faces, partnering with many companies, and organizing a standards body are absolutely necessary. Also, NEC will aggressively adopt the methods of open innovation, lean startup, and financing to solve issues. NEC announced its new corporate key message, "Orchestrating a brighter world", under which NEC group companies will work as one entity to promote the solutions for society business.

This message represents our firm determination that NEC will commit to realize a brighter and more comfortable world through wise use of ICT along with customers and the people of countries and regions around the world, thereby providing social values such as safety, security, efficiency, and equality through "Solutions for Society".

The word "orchestrating" carries the meanings of "cooperation" and "co-creation". The word "brighter" carries the meanings of making the world wiser and smarter.

"Creating new value through ICT, collaborating closely with people around the globe" - this is NEC's strong determination and the core concept of our management.

Solutions for Society

Value innovation
- Open innovation - Partnering - Financing
- Consulting - Operation Service and etc.
ICT asset Big data SDN Cloud Infrastructure Cyber security

Focusing on fundamental issues

\Orchestrating a brighter world

New value/ Creating market

Value for society
Safety Ensuring broad-ranging safety for all from individual country.
Security Serving society and the Earth.
Efficiency Realizing sustainable growth
Equality Closing the social divide and eliminating inequality

Orchestrating a brighter world

- Safer Cities & Public Services
- Lifeline Infrastructure
- Sustainable Earth
- Communication
- Quality of Life
- Industry Eco-System
- Work Style

Solutions that Support the Safety and Security of Society

NEC's safety solution business cultivated over a long period of time addresses threats in people's lives on a global scale. We respect the cultures and diversity in the world and support a bright and abundant society.

For the Safe and Secure Lives of People

Today, the world is facing a spread of various threats and dangers, including natural disasters due to climate change and the diversification of cyberattacks that impact society as a whole. NEC has provided services and solutions for a safe and secure society to cope with these threats at all levels from individuals to families, organizations, societies, and governments, on Earth as well as in outer space. NEC now expands its field of solution provision to cover cyber-security and is working to secure customers' safety in both the real world and cyber space.

The concept for safety business that NEC envisions is to offer cutting-edge technologies and solutions that enable prevention of crisis as well as reinforcement of crisis-response capabilities. To realize a world where people can lead bright and abundant lives in safety and security, NEC presents its new Safer Cities suite of solutions, focusing on seven global domains.

NEC has a proven track record in each domain, particularly in the biometrics identification technology where it has provided more than 500

systems, mostly for automatic fingerprint identification, in nearly 40 countries over the past 30 years. The technology is ranked No.1 in the independent testing done by the U.S. National Institute of Standards and Technology. Currently, NEC is further widening its technical field to offer biometrics matching using a combination of fingerprint, face, vein, and iris identifications.

Global Implementation of Solutions

To combat increasingly complex and escalating threats, it is essential to capture customer needs on a global basis and efficiently implement the optimal solutions in a timely manner, rather than to work on a regional or national level. In April 2013, NEC established the Global Safety Division(GSD) based in Singapore. A total of 500 members from not only Japan, but the Regional Competence Centers in North America, Europe, South America, and China, are working together to promote the safety business. GSD takes the initiative in deploying safety solutions globally. Furthermore, NEC's fifth research center, NEC

Laboratories Singapore, (NLS) was also launched as a base for global solution research in Asia. NEC will build a flexible joint research framework with local research institutes and clients in order to promote active participation in operational testing. NEC, together with its local customers, will develop new solutions using its unique advanced technologies.

Solutions developed in one country or region can be swiftly deployed into the global market because

they are developed with global implementation in consideration. To deliver a global solution to as many customers as possible, NEC promotes the standardization of product development processes and the unification of architectures. Through providing training to local subsidiaries, NEC realizes quick response to customer needs, delivery of high-quality solutions, and becomes a true partner in fighting against security issues.

NEC's Safety Solutions

Seven domains in the global safety solution suites

Citizen Services & Immigration Control

Citizen services and immigration control solutions that leverage as core technologies top-level-accuracy fingerprint identification, facial recognition, and other biometric identification technologies widely used in Japan, the U.S., and many countries around the world.

Law Enforcement

Solutions that support law and order, such as solutions for detection of blacklisted persons using surveillance cameras, coastal security, and intelligence solutions for crime prevention, based on the world's most accurate biometric identification technologies.

Public Administration Services

Solutions that underpin public administration services to promote public safety and security, such as solutions for prevention of infection and manpower management through the use of IT and network technologies nurtured over many years at NEC.

Critical Infrastructure Management

Solutions for preventing occurrences of crime in critical infrastructure, such as airports, harbors, power plants, gas facilities, water treatment facilities, and stadiums, where disruptions pose a massive impact on society.

Information Management

Solutions for cyber security in an information society where hacking and other cyberattacks pose a major threat to people's lives.

Emergency & Disaster Management

Solutions for preventing disasters through early detection of disaster threats, as well as for minimizing damage and facilitating recovery from natural disasters, such as earthquakes, tsunamis, floods, fires, and typhoons.

Inter-Agency Collaboration

Network infrastructure for sharing information among municipalities, government agencies, and relevant institutions and solutions for extracting useful information from big data obtained through information sharing and for analyzing and visualizing data for presentation.

NEC's Strengths

- Biometrics identification technology, including fingerprint identification, used in systems provided to over 40 countries
- Advanced technology that prevents failures with high-precision forecasting and sign analysis by means of big data analysis
- Network control technology and know-how with use of SDN (Software-Defined Networking)
- Organizational structure to swiftly provide latest solutions to meet needs from any market

Implementation of the "Safer Cities" 7 domains around the world

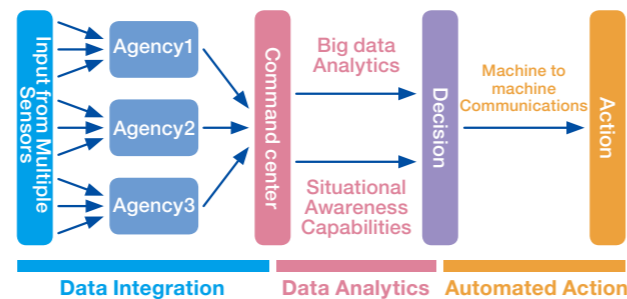**Case Study | Singapore Safe City Testbed**

Solving problems in the big city with NEC ICT solutions

NEC participated in the Singapore Safe City Testbed, driven by the Singapore government, carrying out research and development, and testing of new technologies that can help maintain the safety and security in the society. The goal of this testbed was to establish an information collaboration platform across different governmental agencies to enable Inter-Agency Collaboration (IAC) in solving urban problems. NEC developed and tested solutions where it combined sensors and networks possessed by multiple agencies. The data collected were analyzed using analytic technology based on big data analysis, correlation modeling, and risk determination to detect and predict occurrences of incidents and accidents, the results of which would be shared among relevant agencies in a safe and timely manner.

New developments include the Media Analysis Platform, which enables the plug-in of all types of analytical engines, whether they are in-house or from third-party vendors, for performing large-scale real-time monitoring, the e-Evidence Technology for ensuring video non-repudiation using digital signature technology, and Pervasive Display Network for displaying warnings and evacuation routes in public areas in case of an emergency.

Inter-Agency Collaboration (IAC)

Input from Multiple Sensors → Agency1, Agency2, Agency3 → Command center → Big data Analytics / Situational Awareness Capabilities → Decision → Machine to machine Communications → Action

Data Integration | Data Analytics | Automated Action

A solution to enable detection and prediction of incidents and accidents using integrated analysis of data from surveillance cameras, various sensors such as acoustic sensors, and SNS.

Case Study | Urban Surveillance system in the City of Tigre, Argentina

NEC facial recognition technology Incorporated into the monitoring system to detect suspicious activities

NEC provides the world's fastest and most accurate face recognition technology which is used in the urban surveillance system in the City of Tigre, Argentina. The video feeds from network cameras installed in railway and river stations are checked against a massive database of enrolled photos in real time, to allow prosecutors, judicial institutions, and public welfare organizations to search for missing persons.

NEC has also developed and provided unique technologies such as detection of double riding on a motorcycle, a common method of purse-snatching, detection of riders without a helmet for safety purposes, behavior detection for spotting suspicious behavior (including vehicles), and license plate recognition to identify suspicious or stolen vehicles. NEC has also delivered advanced solutions such as the crime area mapping, to plot the locations of past crimes on a map for better visualization. These latest technologies are incorporated into the urban surveillance system, contributing to safety measures across the city.

With a track record of global deployment of Safer Cities solutions, NEC will continue to contribute to the safety and security of cities through development of technologies, products and services, and enhanced partnerships.

Operation center that integrates the urban surveillance system in the City of Tigre, Argentina. NEC ITC solutions are actively used to improve safety.
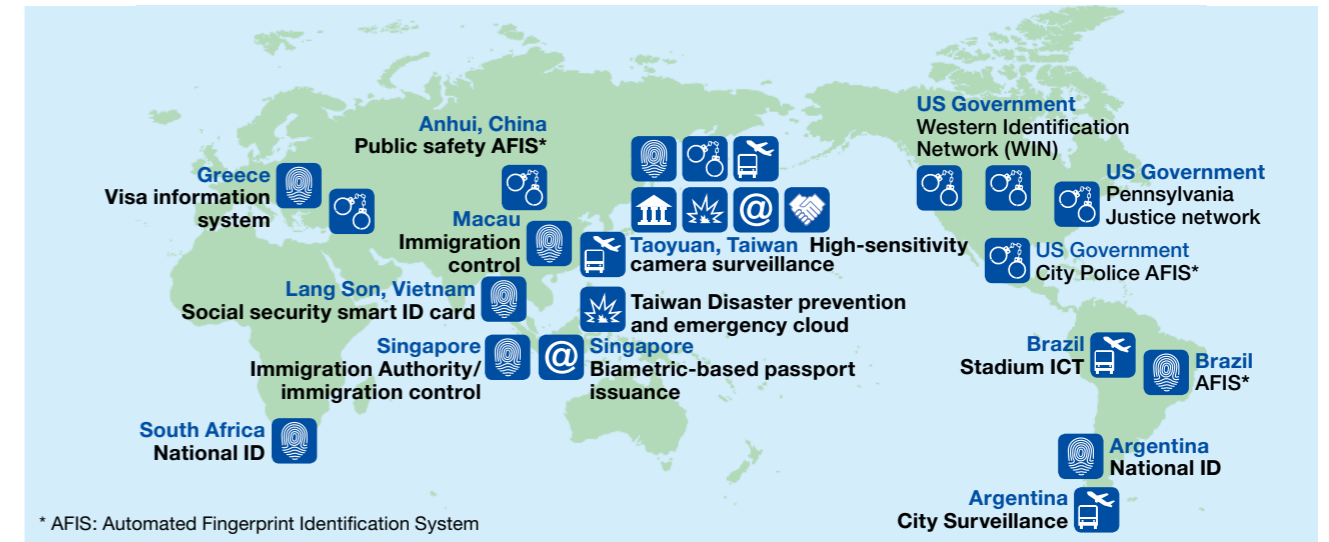
NEC provides advanced technologies and solutions for crisis prevention and enhanced response capabilities. We have defined 7 domains in our new global safety business, "Safer Cities", and have been providing services worldwide, for safer and more secure lives of its people.

Examples of advanced deployment by customers around the world

- Greece — Visa information system
- Anhui, China — Public safety AFIS*
- US Government — Western Identification Network (WIN)
- US Government — Pennsylvania Justice network
- Macau — Immigration control
- Taoyuan, Taiwan — High-sensitivity camera surveillance
- US Government — City Police AFIS*
- Lang Son, Vietnam — Social security smart ID card
- Taiwan — Disaster prevention and emergency cloud
- Brazil — Stadium ICT
- Brazil — AFIS*
- Singapore — Immigration Authority/immigration control
- Singapore — Biometric-based passport issuance
- Argentina — National ID
- South Africa — National ID
- Argentina — City Surveillance

* AFIS: Automated Fingerprint Identification System

Mobilizing NEC's ICT and Know-how: Singapore to Become a Hub That Connects East and West

The Global Safety Division (GSD) is NEC's first business division established outside of Japan with the aim to develop and deploy solutions for a safe and secure society. While NEC has been providing solutions that suit the individual countries and regions, the GSD in Singapore acts as a hub connecting East and West to bring together the technologies and know-how to develop a standardized solution to address the needs of various countries and regions. With the motto "Think global, act local," we continue our efforts in delivering solutions that suits the individual situations of our customers in the various regions, to bring security to more of our customers.

Unfortunately, incidents that threaten our safety are occurring every day in the world, and the growing number of complex events that cannot be easily anticipated are happening. We must not forget that we all have the right to live in safety and that this right must be protected. In collaboration with various government agencies and research institutions. We detect signs of crises by using our cutting-edge technologies and solutions.

We strongly wish to contribute to creating a safe and secure society by providing solutions that enable relevant agencies to share information and collaborate in a timely manner.

TAN Boon Chin, General Manager of NEC Global Safety Division

Preparing for Increasingly Sophisticated Cyberattacks

Cyberattacks are becoming increasingly sophisticated, and in some cases, involvement of some country-level organizations has been suspected. Since new types of threats are emerging one after another, a countermeasure effective to a particular threat will become obsolete more quickly than ever before.
In the modern environment, one must not finish cyber-security countermeasures with simply deploying relevant products. It is necessary to keep managing them in order to keep abreast with defense against cyberattacks.
It is required to take planned security enhancement measures for the whole organization while visualizing the readiness of protections against cyberattacks and determining the level of acceptable risks.
In the face of cyber-security threats, for which no quick remedies are available, it is important to continue to drive the PDCA cycle of policy making to taking action, reviewing effects, and improving in order to continuously raise the level of defense management.
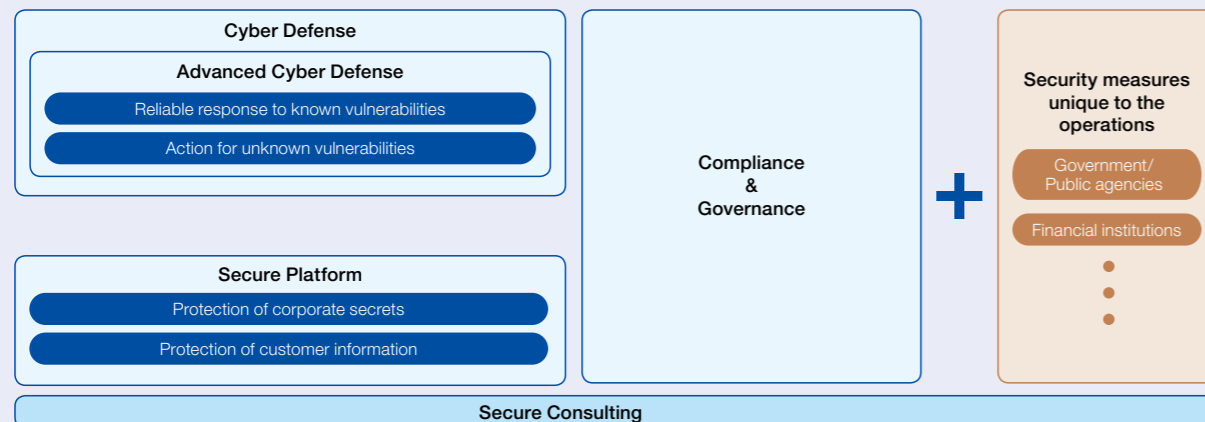
Applying NEC's Experiences to Services

To sustain the security of the ICT environment that connects about 160,000 terminals within the group, NEC has advocated the "Counting Management," in which threats and vulnerability levels are quantitatively captured, and has developed proprietary technology that realizes this concept. Computer Security Incident Response Team (CSIRT) is established within NEC to check for any security issues. When an incident occurs, it adequately judges the situation, reports according to the flow, and swiftly responds to the situation. The accumulated know-how is utilized to build a structure that realizes safe systems.
It is because of our familiarity with customers' systems, and our fight on the front line against sophisticated attacks in coordination with partners that only NEC can help solve customers' problems. NEC's front line efforts and know-how have crystallized into the NEC Cyber Security Solutions.

Proven by Experience and Track Record: NEC Cyber Security Solutions

Drawing on accumulated know-how, NEC offers solutions in four domains to combat the diversifying threats.
 "Cyber Defense" combats cyberattacks by implementing multi-layer protection against targeted attacks, vulnerability diagnostics, and cyber exercises. "Advanced Cyber Defense" offers advanced measures based on advanced technologies and specialist knowledge. "Compliance and Governance" reinforces internal control with detailed measures and trainings based on integrated management of user IDs/logs and visualization. "Secure Platform" provides a foundation for security measures for a number of different platforms, including entry/exit control and carry-in computer quarantine. All of these solutions work together to realize a total reliable security. With services that operate on a suitable combination of security products as the cornerstone, NEC provides total solutions that include necessary personnel training customers need.

Cyber Defense
- Advanced Cyber Defense
  - Reliable response to known vulnerabilities
  - Action for unknown vulnerabilities
- Secure Platform
  - Protection of corporate secrets
  - Protection of customer information

Compliance & Governance

+

Security measures unique to the operations
- Government/Public agencies
- Financial institutions
- •
- •
- •

Secure Consulting

NEC works in cooperation with INTERPOL, headquartered in France, to provide cybersecurity solutions. With an international network of 190 affiliated nations, and NEC's cutting-edge cybersecurity solutions, complex, advanced cybercrime is investigated and analyzed for enhanced security on an international level.
To prevent international crime, INTERPOL has established a new facility in Singapore for research and development, training, and investigation support of cybercrime. NEC provides, the systems and personnel necessary for threat information investigation and analysis, development of and training in new investigation methods at The INTERPOL Digital Crime Center in the same facility. Also in the Cybersecurity Factory, which supports implementation and operation of cyber-attack countermeasures, we provide products and solutions of strategic partners and dispatch personnel for support services.
INTERPOL and NEC, on behalf of affiliated countries, combine our strengths and work daily to develop security countermeasures against increasingly complex and advanced cybercrime.
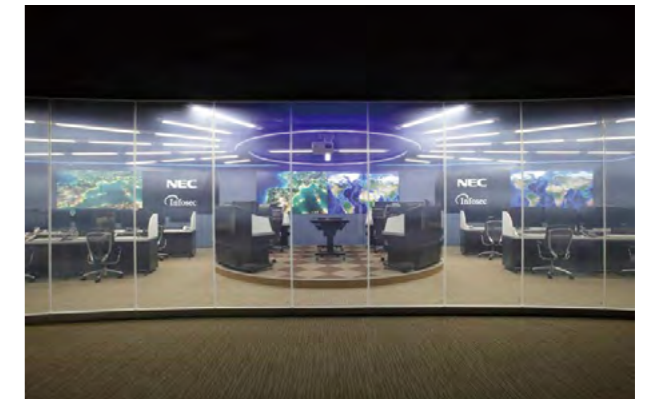
NEC's Cybersecurity Factory provides advanced, total solutions based on our know-how of cyber-attack countermeasure support we provided to Japanese government agencies, major businesses and others.

Protecting Japan from Cyberattacks as a Leader in the Industry

What is most important for cyber-security measures are human. Nevertheless, since the number of engineers is limited, NEC has made a subsidiary specialized in security from early on to promote the cultivation of specialists. Now we have more than 100 cyber-security specialists in the NEC group. This is our advantage over competitors as we moved ahead of them.
For the Tokyo Olympics in 2020, security risks at a global level is expected to arise. In order to address this problem, NEC organized a "Team Japan" structure with our relevant partners, including INTERPOL.

No single company can cope with modern cyberattacks. Hackers are highly motivated and continuously improve their techniques because the higher level of skills directly makes more money for themselves. To stand against this, we must work with our partners.
As a result of working on security issues for 20 years, we have a wide range of accumulated know-how— NEC is tackling security with the determination to protect Japan. Toward the future, we will further collaborative efforts with partners, gather more information, and cultivate specialists with forward-looking knowledge to answer the great expectations from our customers.

Masaya Norifusa, Chief Advanced Technologist of Cyber Security Strategy Group, NEC Business Innovation Unit

Supporting the Safety and Security of Livelihoods and Industries with ICT

Traffic and Urban Infrastructure

NEC takes a variety of approaches to supporting urban and industrial infrastructures.
NEC provides solutions to a wide variety of applications, including airports, roads, railroads, dams and rivers, and management of water and sewer systems.

Safeguarding the Lifelines and Improving Efficiency

An overwhelming swell of worldwide events—changes in the global environment, world population explosion, globalization of human activities, shifts in international power balance associated with the development of emerging countries, and much more—is influencing our everyday life. Devastating natural disasters, tight supply of energy and water resources caused by high demand due to urban population concentration, increase in traffic jam and accidents, and a number of other social issues continue to intensify. Amid such circumstances, the stable operation of the lifelines that support human life, including energy, water, traffic, logistics, broadcasting, and telecommunications, is of the utmost importance.
To make people's everyday life secure and comfortable, as well as assure safety in contingency situations, it is effective to utilize a combination of ICTs.
NEC responds to the needs for a more efficient and stable supply of water and energy, as well as their use, by combining sensors, networks, and

data analyses. As an example, for inspections and maintenance that are critical to sustaining and protecting lifelines, NEC provides the means to save the involvement human in the process of identifying and sensing information from security cameras and vibration sensors. Such data is also collected in real-time via networks and used for forecasting and estimation, making full use of big data analysis techniques that draw on machine learning. Combining cutting-edge ICTs make it possible to prevent unplanned outage by detecting anomalies that lead to failure before they occur. Additionally, the cycle of information collection, analysis and determination, and machine control can be automated and efficiently run by leveraging autonomous robot technology. Likewise, also in the area of traffic and logistics, by analyzing data collected from sensors mounted on traveling vehicles, traffic jam information can be provided in a timely manner and road construction can be implemented at the most appropriate timing—just to name a few examples of applications that bring enhanced economic efficiency as well as safety and security.
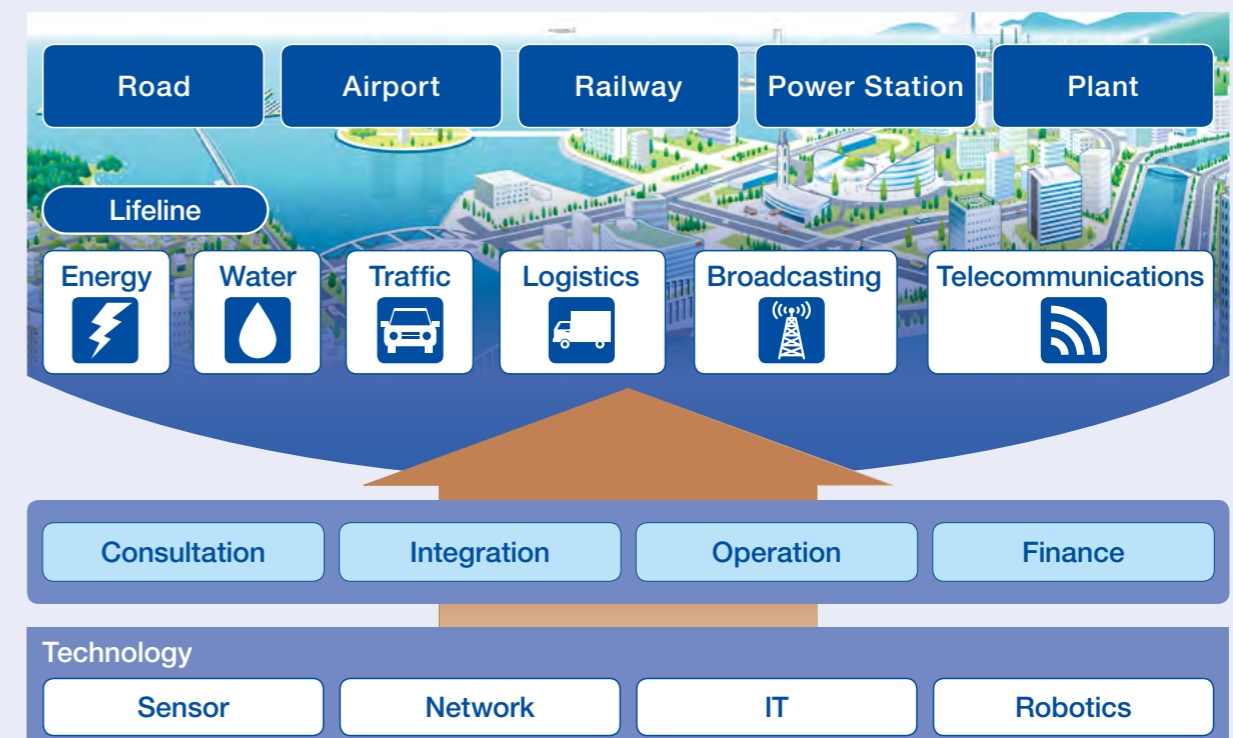
Comprehensive ICT for Core Infrastructure

To efficiently operate key infrastructures, it is effective to combine technologies, including the latest sensors, networks, IT, and robotics. Nevertheless, a mere collection of technologies will not achieve the high stability required of core infrastructure. The key to successful stable operation is the ability to integrate advanced technologies and build up a system as well as extraordinary project management capability.
However, the superiority of technologies to be integrated is also important. For example, NEC has developed a technique for analyzing crowd behavior, which is effective in facilities where a great number of people gather, such as stations and stadiums. This enables the detection of changes in group behavior

in crowded environments where hundreds of people come and go—a feature previously unattainable with techniques that detect and trace individual people. What's more, the high-sensitivity color camera developed by NEC can display bright color images even in low light conditions, thanks to the high-sensitivity technique and image sharpening technology, and also has a haze reduction function that produces clear images even in bad weather conditions. Because this camera can carry out monitoring for 24 hours day and night with the automatic sensitivity adjustment according to environment, it can be used in a wide range of applications, such as surveillance in important facilities, ports, and situation assessment at disaster sites. NEC combines these cutting-edge technologies with its comprehensive prowess to contribute to the safe and secure operation of core infrastructure.

NEC's Strengths

· **Proven track record with control and monitoring systems for road, railroad, aviation, and other types of traffic**
· **Highly reliable broadcast and video systems that provide high quality videos, with a globally well-received track record**
· **Sensor and network technologies that support mission-critical systems**
· **NEC-original algorithm and analytical technology that extract value from sensor information**
· **Robotics technology that achieves efficient diagnosis of urban infrastructure and resource exploration**
· **System integration and project management abilities cultivated in system development for large-scale facilities**

Realizing Total Management of Water Resources

According to the Global Environment Outlook 4 (GEO 4) published by the UN Environment Program (UNEP), the population under water stress and people who suffer water scarcity or unstable availability of water are estimated to reach two-thirds of the world's population by 2015. Securing water resources has become an imperative in the face of the rapidly increasing demand for water.

Additionally, water pipe leaks are a serious problem in Europe and the U.S., where water-related facilities are aging.

For underground water pipes, it is extremely difficult to identify the location of a leak, or perform visual inspections and water leakage monitoring with cameras. Water leaks are generally checked by experienced technicians, who use special leak detectors from the ground to check for leaks by sound. However, leaks may still not be known until a severe water leak accident occurs. The water leakage detection solution that NEC developed in collaboration with Gutermann AG based in

Switzerland, which combines high-precision sensors that detect the sound of running water, networks to transmit the collected data, and a cloud solution for accumulating data, identifies water pipe leaks with pinpoint accuracy based on the analysis results and displays the status of the water leaks on a Web-based management screen. This service allows for an efficient and early detection of water leaks, contributing to the reduction in infrastructure maintenance costs by minimizing damages due to water leakages.

As another approach, NEC is also engaged in joint research with Imperial College London, in which data collected from water pressure sensors and vibration sensors are modeled with big data technology in order to electronically control pumps and valves for more efficient water infrastructure operations. As a result, breakage in aging water pipes can be avoided and a waste-free water infrastructure operation that delivers just the right amount of water for the demand can be ensured. All in all, NEC devotes itself to the resolution of water-related issues through developing and reinforcing partnerships with companies with excellent technologies.

Case Study	Chugoku Electric Power Company

Early detection of anomalies using big data analysis in a large-scale plant

The Shimane Nuclear Power Plant, run by Chugoku Electric Power Company, has adopted NEC's Prediction Monitoring and Diagnostic System, which uses a massive amount of operation data (big data), including output, temperature, and pressure, to detect abnormal operation at an early stage.

The failure prediction monitoring system is the world's first system that uses data gathered from a large number of sensors installed in factories, power plants, and other large-scale industries for analysis using NEC-unique Invariant Analysis technology to discover any anomalies before they result in failures.

Three years of research with Chugoku Electric Power Co., Inc. proved that it is possible to detect failures at several hours earlier stage then before by analyzing data from actual abnormalities in the past. By discovering failures at an early stage, damages to plants can be minimized and switching to a backup unit and repairs are made possible.

Invariant Analyzer technology
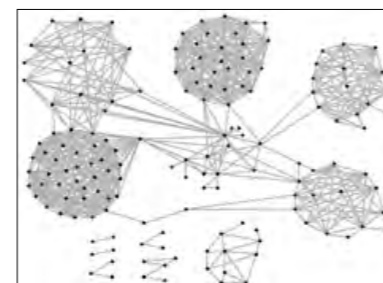
Automatically mapping the depth of relationship among all sensors during normal operation helps discover any abnormal relationships in operation.


Development Policy for Products and Technologies That Support Solutions for Society

The three most important issues in social infrastructure are: aging infrastructure, shortage of natural resources and energy, and low birth rate and an aging population (labor force shortage). NEC leverages the autonomous robot technology as well as its proprietary technologies that Integrate IT, networks, and sensors. The most notable applications of robot technology include the detection of aged, deteriorated parts in the infrastructure, resource exploration, and power assist solutions for elderly people and operators. As a security measure, NEC also aims to enable swift recovery of social infrastructure in case of large-scale disasters by sophisticating the ICT backbone of urban infrastructure by means of IT technologies such big data, cloud computing, and cyber security, combined with network technologies such as SDN and software-defined radio.

In the development of robot technology, NEC conducted empirical research with Japan Sewage Works Agency using dedicated inspection robots for the purpose of realizing efficient maintenance and longer life of sewage conduit facilities. This research was realized with the cooperation of Funabashi City, which provided the conduit field. Even when the conduits are not cleaned, the dedicated inspection robots capture optimal images for image analysis, which is performed with NEC's proprietary image analysis technique that allows automatic detection of breakage and other problems in the conduits. This solution can significantly reduce the man-hours required for the inspection and assessment of deterioration in sewage conduits.

NEC aspires to showcase Japan's technical prowess to the rest of the world and realize a variety of solutions for the future.
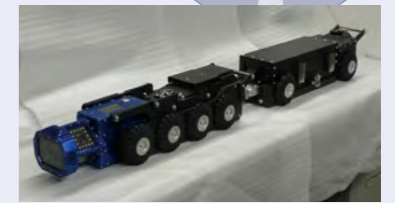
Sewage pipe inspection robot

Yutaka Ukegawa, Senior Vice President of NEC

Case Study	Airport Solution

Global development of airport solutions

As demand for air transportation increases year after year, it leads to excessively dense and crowded airports and air routes, and demands system development for achieving efficient and safe air navigation. Additionally, because system failures may have great effects on society, an absolutely reliable system is essential.

For over fifty years, NEC has continued to provide airport solutions across the world, with a focus in Japan and other parts of Asia. NEC's air traffic control radar uses the latest semiconductor circuit technology and signal processing technology to accurately detect aircraft in the airspace. Secondary monitoring radar can acquire aircraft information even in congested airspace, improving the effectiveness of air traffic control services, and contributing to smooth, safe air traffic control. NEC's track records of commercial contracts in 2013 include air traffic control radar from the Civil Aviation Authority of Taiwan for the Taoyuan International Airport and Taichung International Airport, and Civil Aviation Authority of Nepal for the Tribhuvan International Airport modernization project in Kathmandu. From here on, NEC will

continue to enhance air traffic control related solutions, and accelerate activities to meet regional needs.
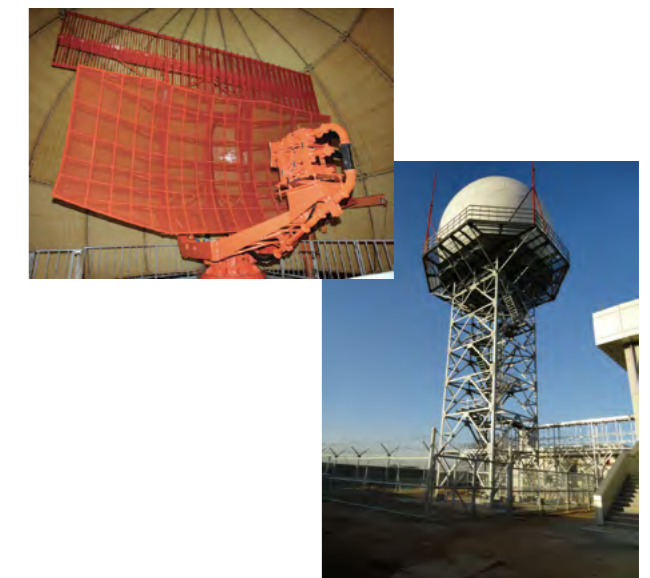
Advanced Network Solutions Enabled by NEC's ICT

NEC continues to deliver simple yet flexible network development, customer operations and swift service deployment with SDN solutions through the fusion of ICT and network technologies.

Solution for Telecom Carriers that Contributes to the Establishment of Social Infrastructure

In the aspects of technical and service innovations, social demand, intensified competition, and diversified services, the environment surrounding telecom carriers has drastically changed in recent years. Reduction of capital investment and operating costs, as well as increasing profits, have become vital management issues for telecom carriers with the upsurge of global data traffic associated with the popularization of smartphones and increased use of cloud.

With a rich track record in the global market for catering to the demand and needs of telecom carriers, NEC offers solutions in the following three major fields:
(1)Network Solutions: Wireless broadband access, mobile backhaul, core and metro networks, submarine cable systems, etc.
(2)Service Solutions: Smartphone services, M2M services, carrier cloud, data centers, etc

(3)Telecom Operation & Management Systems (TOMS) for efficient operation and management solution for telecom carriers
NEC has abundant experience in telecommunications market. The highly reliable, high-quality microwave radio system PASOLINK was developed over the long history of NEC's radio communications business and is widely adopted abroad.
NEC is also a top-class vendor that has been dealing with the submarine cable system business for more than 40 years, installing cables totaling up to a distance of over 200,000 kilometers—about 5 times the circumference of the Earth—mainly in Japan

A total of 2.2 million units of PASOLINK—ultra-compact microwave radio system—have been delivered to over 150 countries around the world

Telecom Carrier Solutions
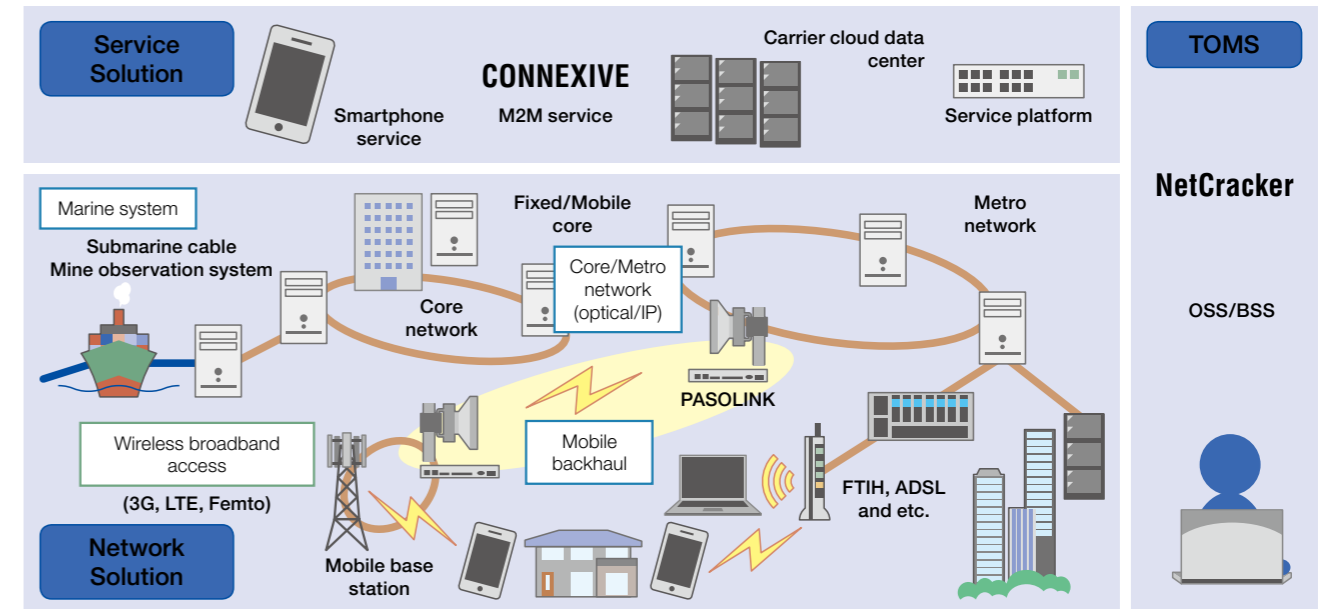
and the Asia-Pacific region.
In the field of network virtualization and control, specifically Software-Defined Networking (SDN) and Network Functions Virtualization (NFV), NEC contributes to the diversification and sophistication of the telecommunications business.
NEC is also dedicated to delivering TOMS through with NetCracker Technology (NetCracker), a US subsidiary of NEC, to support the operations and management of telecom carriers worldwide.

Orchestration of IT and Network Technologies to Create Values for the Next Generation

To support the establishment of next-generation telecom carrier networks, NEC is developing wireless broadband solutions such as 5G, which is the next generation of LTE, and SDN/NFV-based network solutions.
With regard to 5G development, NEC is a member of international standardization organizations, in which it is proactively contributing to global technical innovations

toward the target year of 2020.
In the SDN and NFV domains, NEC is engaged in the evolution of technologies toward the development of a simple yet flexible next-generation network infrastructure by way of extending and applying virtualization techniques in the IT field.
Network functions are virtualized via SDN and NFV by configuring a number of virtual networks on a physical network depending on the intended use for dynamic optimization.
Route and resource control algorithms and automatic coordination control techniques for reducing total operating costs have realized optimal traffic handling in the domains of wireless access, transport, SDN and NFV.
NEC has already started providing these virtualization solutions for communication networks and data centers such as "virtualized Evolved Packet Core" (vEPC), "virtualized Mobile Virtual Network Operator" (vMVNO), "virtualized Customer Premises Equipment" (vCPE), and the UNIVERGE PF series. We are well ahead of competitors with a field-proven track record.

NEC's Strengths

- Being a unique company that has businesses, technical capabilities, and know-how in both the IT and network fields
- Credibility, track record and experience fostered in the infrastructure business for telecom carriers over 150 countries
- Proven track record in supporting the operations and management of global telecom carriers through TOMS
- Being a leader in SDN efforts that bring innovative changes to network architecture

Telecom Carrier Market Environment and TOMS

In the midst of growing data traffic associated with diversified services and the wide spread use of applications, the reduction of capital investment and operating costs, as well as increasing profits, have become vital management issues for telecom carriers. NEC supports management streamlining and traffic monetization with its advanced next-generation network operation and management systems. The implementation of TOMS, consisting of Operation Support System (OSS) and Business Support System (BSS), will enable telecom carriers to integrally operate and manage their entire business and networks.

For example, such implementations will enable carriers to deliver a one-stop solution that covers all processes from reception of subscription requests, deployment, and

invoicing, or prompt subscribers to purchase additional bandwidth, as necessary, according to their tariff plans. In this way, real-time network set-up and billing service provision can be made possible.

NEC's Efforts in TOMS

NEC acquired the OSS vender NetCracker Technology in 2008. Further, NEC bought out the Information Management division of the BSS vendor Convergys in 2012. Having integrated these two companies' technologies, NEC offers OSS and BSS solutions on a global scale.

The shared platform that incorporates the OSS functions including resource management, network monitoring, service deployment, and operation monitoring, and the BSS functions including customer management and billing management enables the provision of solutions that address diverse needs and issues of telecom carriers.

Providing Solutions with Both Innovation and Value: Track Record of NetCracker as NEC's Partner

In order to survive the competition of a dynamically changing world, we need high quality customer service, quick response to market, and stringent cost management. Particularly in the case of telecom carriers and other service providers, it is necessary to correctly understand every factor, including infrastructure, user demands, and limits of corporate resources. NetCracker has a remarkable track record in OSS/BSS solutions for international service providers and has been providing

industry-leading services to more than 200 corporate clients worldwide for over 20 years.

Their track record of providing 24/7 mission-critical solutions to telecom carriers around the globe has earned the company a good reputation. The solutions provided to communications firms, governments, energy businesses, and wholesalers offer high added value for solving problems in infrastructure and customer support.

NetCracker Technology's Track Records with Major Telecom Carriers in the OSS/BSS Field

America Movil (Mexico) /AT&T (the United States) /Cox Communications (the United States) / DeutscheTelekom AG (Germany) / France Telecom Group (France) /MTS (Russia) /Sprint Nextel (the United States) / Tata Communications (India) /Telecom Italia (Italy) / Telefonica (Spain) /Telstra (Australia) /TELUS (Canada) /Verizon (the United States) /Virgin Media (the United Kingdom) and others

NetCracker's Strength in Utilizing Synergy with NEC

NetCracker supports the realization of efficient operations and management of network business by communication service providers (CSP) worldwide as a global leader in OSS and BSS solutions. NetCracker's assets and competence has been greatly enhanced in synergy with NEC and utilized for the development of cutting-edge solutions, including SDN and NFV, Big Data analysis, policy management, and network traffic optimization.

While CSPs envision a new network scheme based on next-generation SDN and NFV, NEC and NetCracker offer a solution for the seamless and end-to-end integration of existing networks and SDNs. SDN and NFV have the potential to radically change the way CSP networks are operated and managed. The value proposition of NEC and NetCracker in this domain has been well received by customers all over the world, and trials are being conducted with numerous CSPs to verify this solution. As described in the aforementioned case, by combining NEC's network technology and NetCracker's network orchestration technology, we will contribute to the development of new networks.

Big Data analysis is another area in which there is great synergy between the two companies. NEC and NetCracker both have unique solutions that realize real-time analytics, streaming media analytics, and network optimization, all of which are imperative for successful

CSPs. By enhancing CSP's customer service support quality through analyzing their customer data, we can help achieve their improved profitability and customer satisfaction. NEC and NetCracker are also working on strengthening a collaboration to expand and enrich our OSS and BSS solution portfolio. In the network policy management and traffic optimization field, we are developing solutions that flexibly manage customer experiences based on customer profile. While general policy control solutions are at the center of network and service management, NEC and NetCracker will propose solutions based on different concepts than our competitors.

These are just a few examples of our collaboration that delivers great benefits to our customers. I believe that both NEC and NetCracker will further grow as strategic venders for CSPs.

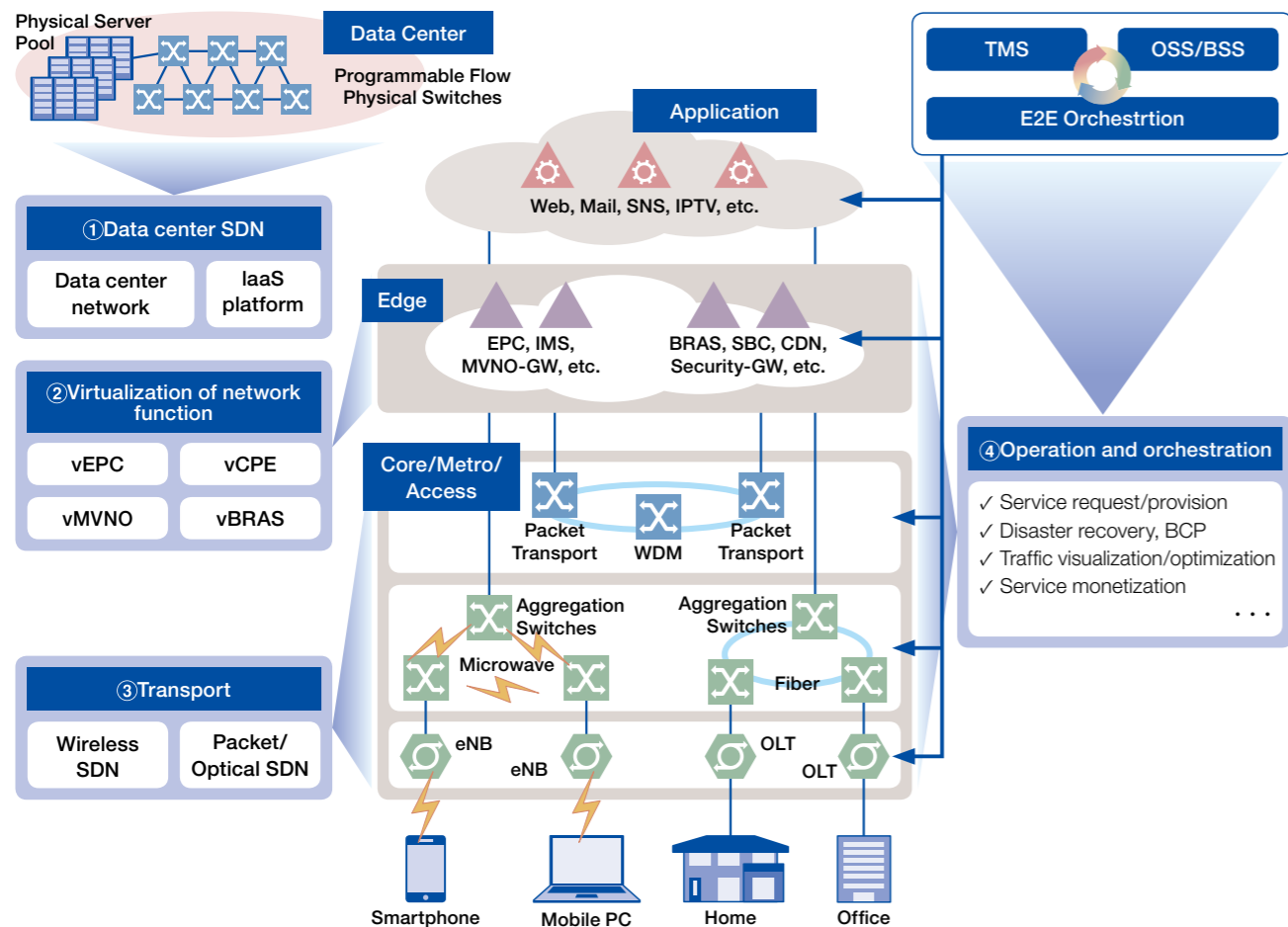Andrew Feinberg, President & CEO of NetCracker Technology

SDN and NFV Realize the Needs for Sophisticated and Diversifying Telecommunications Services

In recent years, there has been a rapid growth of video and message distributors that provide services through smartphones. Also, along with the penetration of the "Internet of Things" which connects a whole variety of things to networks, the type of demands diversify, such as network security and bandwidth-guaranteed networks. Telecom carriers, who operate communications infrastructure, will experience difficulty in securing revenue that measure up to investment simply by building an individual network for each different requirement. Additionally, it will take up to a few months' time for them to respond to the changes, which can lead to opportunity losses.

It is SDN that is expected to be a breakthrough for this problem. With NEC's SDN solution, virtualization technologies are applicable to not only networks, but also service control nodes. Resource deployment suitable for the requirements set out by users and service providers are dynamically performed across the whole network system in order to achieve equipment streamlining for efficient response to increasing and fluctuating traffic.
As an example of the application of SDN in the telecom market, there is the adoption of SDN in the cloud infrastructure of Biz Hosting Enterprise Cloud of NTT Communications, who is actively globalizing its business.
SDN will deliver higher value in collaboration with peripheral technologies, such as TOMS and Big Data technologies.

NEC's Telecom Carrier SDN Solution Menu

Wide-Range of Solutions that Support Use Cases and Migrations for Telecom Carriers

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Stimulating Economic Activities and Enhancing Core Telecommunications Infrastructure for the General Public in Myanmar

NEC formed a consortium with Sumitomo Corporation and NTT Communications to build telecommunications infrastructure, provide operational support, and improve the internet connection environment in the Republic of the Union of Myanmar.
A core optical communications network with a transfer rate of 30 Gbps between the cities of Yangon, Mandalay, and Naypyidaw was installed, as well as LTE communications, landlines, and a 10 Gbps optical communications network enabling an Internet connection, along with an LTE base station in each city. Cutting-edge communications equipment was deployed at the communications station facilities, such as an LTE virtualized Mobile Core Network vEPC on a compact, IA server with a virtual infrastructure, and an optical transmission device with a 100 gigabit Ethernet connection. It realized the simultaneous use of LTE communications, landlines, and an Internet connection to improve the telecommunication environment in Myanmar. Through environmental improvement, expanded functionality and improved operation for Myanmar's Internet service provider, we are contributing to raising the level of Myanmar's network communication infrastructures that provide a basis for people's lives and help stimulate the economy, up to that of advanced countries.

In 2014, Myanmar took the chairmanship of ASEAN, and this expansion of telecommunications infrastructure is sure to help elevate the presence of Myanmar in the international arena.

Creating New Added Value by Solving Telecom Carriers' Issues with SDN and NFV

In this age where a vast variety of services are created in the world of the IoT and increasing number of smartphone population, it is essential to provide network services in keeping with the service level agreement (SLA) that guarantees users the best quality.
Furthermore, in response to the recent rapid increase in communication traffic, it is also necessary to offer networks with better efficiency by effectively using infrastructure as a common resource as well as swiftly responding to user requests with open technologies.
As service demand changes, network maintenance can be further minimized by increasing the sophistication of the orchestration and implementing necessary automation, which can fulfill needs flexibly and on demand without compromising quality.
In the near future, an even wider variety of devices will connect to networks. By efficiently collecting information sent from these devices as Big Data by means of network technologies, analyzing the data with ICT, and utilizing it to forecast future events, we can accelerate the creation of new services.
In this diversified environment, NEC continues to create, with SDN and NFV, new business models that satisfy both the users and operators.

Atsuo Kawamura, Senior Vice President of NEC

Energy Management Systems that Optimize the Balance of Supply and Demand

A large-scale utilization of renewable energy is a key to solving the global energy issue. NEC information and communications technology (ICT) and energy component technology can help meet the increasing demand for it.

Supporting renewable energy efforts from individuals to businesses with the world's best ICT and energy storage system technologies

With the world's best ICT and energy component technology such as energy storage systems, NEC is creating Energy Cloud services and added value to realize a comfortable, rich society. These products contribute to promoting the spread of renewable energy sources, optimizing energy supply and demand, and creation of countermeasures against power outage during disasters.
For energy management systems, NEC offers charge/discharge control of energy storage systems in line with predicted power generation of renewable energy sources. We also provide smart energy solutions to businesses such as power utility companies and telecommunications companies as well as the average home in the form of demand and response technology that combines our assets and makes use of large-scale energy storage systems installed in factories and energy storage systems installed in private homes.

Customers	Power utility companies Developers Power producers	Data centers Office buildings Factories	New markets (Stores and evacuation shelters)	Telecom Carriers	Average homes Stores
Solution	Introduce renewable energy Adjust frequency Backup, etc.	Brownout countermeasures Peak cut Peak shift	Brownout countermeasures Peak cut Peak shift	Backup	Backup Peak cut Peak shift
	Lineage systems	Systems for data centers	Alternative to lead batteries	Systems for base stations	Systems for households
Merchandise	Already commercialized	Commercially available	Already commercialized	Currently in verification testing	Already commercialized
	1 to 100 MW class	10kW~	~10kW	10kW~	5.53kWh~

Imminent demand for switching to alternative energy

Electricity is indispensable for our daily lives. However, due to increasing demand in emerging countries, unstable international situations, and economic changes, our main energy source of fossil fuels shows a tendency toward increased prices in the long term. Additionally, recoverable reserves for each resource are limited and expected to last for 53 more years for petroleum, 56 more years for natural gas, and 106 more years for coal.
Fossil fuels also produce greenhouse gases, which lead to global warming. The tremendous energy demand of emerging countries is estimated to increase CO2 emissions out of worldwide energy demands by 20% from 2011 to 2035.
Dependency on fossil fuels is particularly high in Japan, putting pressure on national finances with the record-high trade deficit. The cost of electricity has also risen, increasing the burden not only on households, but businesses as well, affecting economic growth and industrial activities. Increased power outages due to abnormal weather and natural disasters are also a problem. Counter-risk measures to deal with disasters are needed for businesses as well as households.
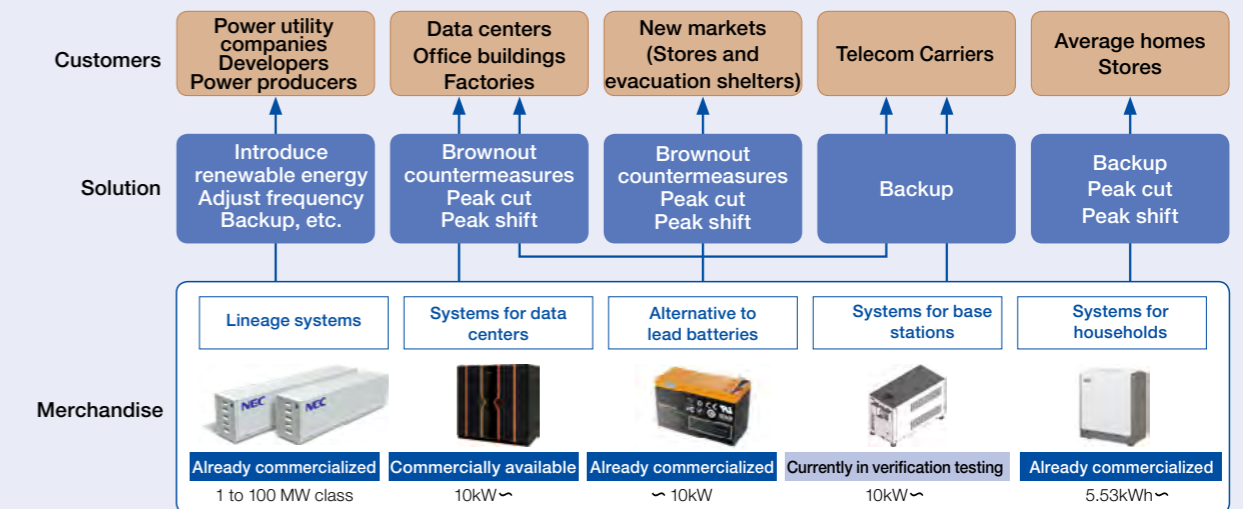
Renewable energy — Hopes and challenges

New sources of renewable energy such as solar power and wind power are steadily gaining traction, and are expected to be used in more offices, factories, and households. However, because the amount of power generated by these renewable energy sources relies on weather conditions and the time of day, striking a right balance with power demands is difficult when compared with other sources such as thermal power generation.
In the April 2014 "Basic Energy Plan", the Ministry of Economy, Trade and Industry's Agency for Natural Resources and Energy reports, "Reforms to the electrical power system may result in changes to power configuration, necessitating system stabilization measures such as investment in not only new power generation facilities for renewable energy, but also power grid facilities, adjustable power sources, and storage batteries that are compatible with power generation time slots and output properties, which will all require large-scale investment."

In order to make renewable energy reliable, a new configuration and system development that maintains the balance of energy supply and demand, and stabilizes the electrical power system is necessary.

Providing the latest smart energy solutions

NEC possesses both ICT such as computer and cloud technology, and energy component technology including energy storage systems and AMI (Advanced Metering Infrastructure). In a society using massive amounts of renewable energy, it is anticipated that efforts to stabilize the balance of energy supply and demand will increase at both the consumers and suppliers of power. Consumers could reduce energy consumption with visualization of power generation and consumption amounts and store excess power in energy storage systems during times of lower consumption for use when the power is short supply. On the other hand, in order to stabilize the amount of generated power that fluctuates according to weather and the time of day, suppliers could use energy storage systems to temporarily store generated power and then supply it according to consumer needs. By utilizing the accumulated technical know-how, NEC's energy storage systems are

NEC's Strengths

- Abilty to propose optimal systems for actual implementation scenarios with experiences of participation in domestic and overseas field trials.
- Energy storage technology equipped with energy management functions that use grid connection function and cloud services
- Providing electrodes for storage batteries embedded in the Nissan Leaf, achieving a high level of safety and durability.
- High level of technical know-how in lithium-ion batteries backed by many years of R&D experience
- Production capacity of the world's largest electrode factory.

equipped with energy management features that use grid connection system functions and cloud services that are linked with the power grid network and solar batteries. These are used to link energy storage systems and cloud networks that are increasingly deployed in various locations, contributing to a more stable energy supply and demand for those regions.

Additionally, NEC has carried out field trials to utilize the knowledge cultivated in developing lithium-ion batteries for electric vehicles and for consumer use for high-voltage, high-current large-scale energy storage systems. From here on, NEC will continue to provide the latest smart energy solutions driven by ICT.

Existing power generation
Execution of effective and lean power generation

Thermal power station / Water power station

Link with other region through smart grid

NEC's Cloud
Collection and analysis of energy related data
Big data
xEMS
CEMS
Control the balance of power demand and supply

Residence
Promotion of local production for local consumption
HEMS MEMS
House/Apartment house

Urban/Industrial area
Peak shift
Optimization of peak cut and others
BEMS FEMS
Office buildings/Factories

Renewable energy
Absorption and stabilization of the fluctuation of power generation

Power
Telecommunication
Energy storage system

NEC Energy Management Systems use cloud networking and energy storage systems (ESS) which have become commonplace in various locations, integrating energy visualization, prediction, and control, and contributing to optimization of regional energy demand. These systems enable both energy conservation and a comfortable life.

Case Study ENEL Distribuzione

Delivery of megawatt scale lithium-ion energy storage system to ENEL a major Italian power utility company

NEC delivered a megawatt scale lithium-ion energy storage system to Italy's largest power distributor, ENEL Distribuzione, an affiliate company of the major Italian power utility company, ENEL SpA. This system is intended to make a next-generation smart grid possible with a power of 2 MW, and a capacity of 2 MWh.
This energy storage system was installed in the Chiaravalle substation and connected to the ENEL power grid in southern Italy where the renewable energy sources are widely in use such as wind power and solar power that are easily affected by the weather. Verification testing is being carried out for balancing supply and demand during peak usage times, adjusting frequencies to stabilize electricity and voltage, controlling the electrical grid, and adjusting the quality of the power. This system controls the amount of power between the power grids that cover the entire part of Italy. ENEL estimates the amount of power fed into the power grid from the primary substation and submits planned amounts to the power distributors. When the actual power output exceeds the estimated amounts beyond the expected range due to the fluctuation of power output of renewable energy sources, the energy

storage system flexibly charges or discharges electricity to minimize the difference in power output.
Ultimately, the use of smart meters, at homes/offices/factories, big data analysis, and real time and bi-directional use of power demand information made possible by ICT are put in place. This technology will enable integration with ENEL group's smart grid infrastructure.

Energy storage system installed in a substation and connected to the actual power grid. The energy storage system covers the balance of supply and demand affected by changes in the solar power and wind power facilities installed in the region.

NEC provides optimal energy storage solutions for customers around the world

The mission of our business unit is to provide solutions that make the best use of NEC strengths for customers who handle energy. We merged two businesses, one that originally provided ICT solutions to power companies, etc., and the other that developed lithium-ion batteries for consumer use and electric vehicles, for the purpose of providing safe, secure, effective, and equal solutions in the form of large-scale energy storage systems to power companies.
The trigger for this was the order for a system we got from the large Italian power company, ENEL. Because this was the first-ever project in the energy field from overseas, we started development began from scratch. Although a large investment was required, as a

company we decided to do it because this was absolutely necessary for our future. Although this was an extremely difficult request, thanks to the cooperation of both Japanese and Italian team members, we successfully delivered it in February 2014. As a strategy for further global development, NEC acquired A123 Solutions, the energy storage SI unit of A123 Systems in US. who has the world's best delivery track record in this field, and established the new company 'NEC Energy Solutions' in May of this year. As of 2014, NEC Energy Solutions has ever supplied systems to up to 11 companies worldwide, with the total output of 110 MW, which is the evidence of the company's ability to provide customers with optimal systems. From here on, we plan on utilizing NEC's data analysis technologies to provide optimal energy storage solutions for customers around the world.

Hideki Niwaya, Vice President of NEC Smart Energy Business Unit

Bud Collins, CEO of NEC Energy Solutions

"NEC Energy Solutions" large-scale energy storage system deployed around the world

Best delivery track record in the world: 11 countries and over 110 MW across the world

2 MW/500 kWh 2008 · 20 MW/5 MWh 2013 · 8 MW/2 MWh 2011 · 350 kW/700 kWh 2013 · 400 kW/100 kWh 2010 · 2.5 MW/5 MWh 2013 · 2 MW/500 kWh 2013 · 2 MW/500 kWh 2013 · 4 MW/1 MWh 2011 · 32 MW/8 MWh 2011 · 1 MW/3 MWh 2013 · 2 MW/2 MWh 2014 · 500 kW/125 kWh 2013 · 1 MW/2.8 MWh 2014 · 1 MW/1 MWh 2013 · 11 MW/4.4 MWh 2012 · 20 MW/5 MWh 2011 · 12 MW/4 MWh 2009 · 280kW/135kWh 2014

Frequency adjustment
Supplementing renewable energy
Standby power
Power grid support

Frequency adjustment: Switch from charge to discharge in accordance with frequency fluctuations in power generation, thereby stabilizing frequencies.
Supplementing renewable energy: Switch from charge to discharge in accordance with frequency fluctuations in renewable energy power generation, thereby stabilizing power generation.
Standby power: Power is discharged during sudden changes such as power outages, thereby stabilizing power supply.
Power grid support: Can be used as an alternative to the addition of power grid facilities, thereby reducing facilities investment costs.

Transform your potential to business growth

NEC collaborates with businesses around the world, employing proven expertise and advanced Information and Communication Technology (ICT). Together, we develop innovative, optimized solutions that help orchestrate a brighter world.

## Significant support of global retail development with RBC as a hub

As a part of its global strategy to strengthen and expand retail business solutions, NEC has established the Regional Business Support Center (RBC) at NEC Asia Pacific, the regional headquarters in the Asia Pacific (APAC). From POS and headquarters systems that cover everything from sales, orders, inventory, and inspection tasks to branch and product management at headquarters, our experience of total solutions for major Japanese retailers has been standardized for the worldwide market. We are promoting it with our unique know-how.
RBC is responsible for regional strategies, sales and technical support, personnel training, and coordination with the subsidiaries in APAC. For multi-location retailers such as convenience stores, RBC takes the lead locally in solution proposals and support. The chain store management experience cultivated by NEC inside and outside of Japan has been packaged as DCMStar/ChainStore, and is

used to promote sales for retailers mainly in APAC. RBC mainly uses local staff along with standardized and documented NEC know-how that has been localized for each area to produce positive feedback cycles.
A solution package specialized for North American chain stores is also available. Additionally, features are being enhanced inside and outside Japan such as the NEC Mobile POS Solution, a low-cost POS system powered by a cloud service and run on tablet devices, reservation management systems, and the O2O (Online to Offline) electronic receipt system.

Global development led by RBCs
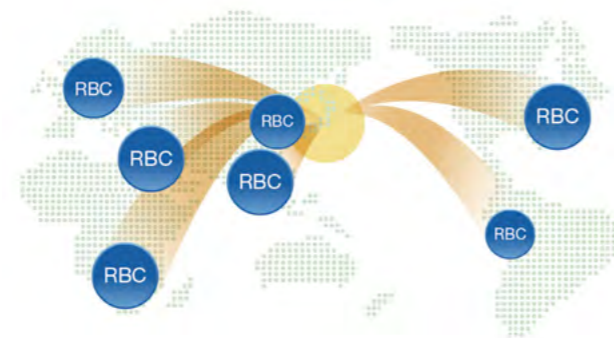
NEC Global Enterprise Solutions

Industry	Function/Operation
Retail	In-Store Operation
	Merchandising
	CRM
	Payment
Hospitality	Smart hospitality
Logistics	Logistics Visualization System
Manufacturing	ERP/SCM/MES
	PLM
	CRM
	M2M
	Electronics design and development support
Automotive	Dealer Management System
Cross Industry	ERP
	Smart Energy
	Business Consulting Services
	LCM Service

Supporting logistics innovation through new-age logistics solutions

The business of logistics faces mountains of problems including shortened lead times, inefficient inventory control, real-time visibility of logistics information and ensuring traceability, delays in passing through customs due to increased sea freight, inefficient management of delivery vehicles, understaffing, and environmental protections such as exhaust regulations.
For such situations, NEC can provide strategic, cutting-edge ICT solutions for monitoring the entire logistics and warehousing process and optimizing all phases for global compliance. "Visibility" is absolutely vital for global logistics when it comes to proper inventory management, efficient administration, and

enhancing the competitive edge of a business. This visibility of both domestic and overseas global logistics is made possible by cloud services.

Supporting manufacturing business with total solutions

In the manufacturing field, NEC offers private cloud services that serve as the IT foundation for the global core systems of companies. M2M (Machine to Machine) solutions are also available. Total solutions are available for production environment data collection, ranging from embedded sensors in all types of machinery, equipment, and cloud services to industrial applications for businesses. NEC provides total M2M support with consulting at the planning stages, service infrastructure and so on.

NEC's Strengths

- · Providing Japan-quality solution values, incorporating the latest ICT
- · A track record of the retail system employed by convenience stores, a business category in which Japan is the industry leader
- · Ability to propose inventory management through cross-border visualization of the logistics process
- · Experience and know-how in manufacturing innovations and supply chain innovations within NEC
- · Ability to design solutions by utilizing NEC-original technologies such as big data in collaboration with customers

Optimizing resources while building for tomorrow

One of the largest retail chains in the world, 7-Eleven, Inc., is successful because it constantly monitors and responds to customers' needs. NEC serves as a strategic partner to 7-Eleven, providing store-centric solutions that empower the company in a way that minimizes labor, energy and transportation costs while optimizing product assortment and just-in-time delivery.
NEC empowers governments and business organizations to engineer new solutions that better serve their constituencies while minimizing the impact on our planet.

7-Eleven monitors and responds to customers' needs

Case Study | Fuji Xerox Co., Ltd.

Logistics cloud service at the core of the Fuji Xerox transportation visualization system

Fuji Xerox develops, produces, and sells digital copiers and printers across the global market. In order to visualize the transportation status of products being delivered to hub warehouses and sales companies around the world, Fuji Xerox introduced the NEC transportation status visualization system. Previously, because order information and container bill of lading information was manually associated and estimated warehousing dates were calculated after checking the status with forwarders in response to a large number of delivery inquiries from sales companies, it was difficult to make delivery replies in a timely and accurate manner. The number of inquiries to headquarters reached approximately 1,800 per month, and this massive amount of checking was a burden for officers who manually handled them. Also, in order to avoid running out of stock at each distribution hub, each warehouse kept a large amount of security stock, resulting in overstocking. The transportation visualization system, which can grasp what item is in which location on a

real-time basis, improves the accuracy and speed of replies to delivery inquiries and the ratio of on-time delivery. Collecting information from factories and logistics partners, manual order association and preventive overstocking were made unnecessary, resulting insignificant cost reduction.

Staff can search a product code to check in which container the product is.

NEC has continued to provide IT support to multi-store chain customers, such as convenience stores in and outside Japan. Our global development concept is to standardize the many years of experience and know-how and offer it to overseas customers. In May 2013, we opened an RBC in Malaysia to train over 100 staffers of overseas subsidiaries and sales partners, using concepts such as 'What IT changes are occurring in Japanese convenience stores?', 'Specifically, what is NEC's experience and know-how?', 'What delivery and proposal methods can we use to support customers?'. This resulted in local staff being able to explain and demonstrate these concepts themselves, including the use of case studies. By actually experiencing the implementation of services to customers themselves, local

staff has become able to pitch more proactive proposals with their own words and experience, creating a positive feedback cycle locally. For example, staff in Thailand with experience in supporting major customers there has become able to make proposals in the neighboring countries such as Myanmar and Cambodia. We believe that creating this process in each country is very important. Although we have many competitors, there are not so many single companies that can offer everything from hardware and software to system planning, implementation, development, and maintenance service like NEC can. Leveraging our greatest strength of know-how and the RBC model, we will continue to develop services for other industries such as logistics, supporting customers in the world with IT.

Takayuki Inaba,
The head of APAC RBC

* LCM: Life Cycle Management

Case Study | EXEDY Corporation

Visualization of management information by collecting accurate global data with NEC solutions

Exedy is an automotive parts manufacturer. In order to promote management based on accurate data, Exedy worked with NEC to rebuild their global management platform. Since there were problems with data reliability and speed in their previous core systems, which made proper management decisions difficult, Exedy was in urgent need of a core system that support management based on accurate data to achieve their goals. NEC, with its solid track record of providing solutions for the automotive parts industry, was able to achieve the visualization of management information for Exedy.
Exedy doesn't mean "observing" or "not overlooking" changes and conditions in and outside the company by saying the term "visualization". They ensure flexibility and scalability with a focus on business growth. They also streamlined the integrated cost management cycle of cost planning, cost retention and reduction, and captured

performance data from the sites that support the cycle.. Thus, visualization of cost data, which is the heart of manufacturing, was achieved. This platform was also deployed in their overseas affiliate companies, and Exedy is working together with NEC towards the goal of visualization from a global standpoint in order to improve their competitive edge.

Exedy's main products, the torque converter and clutch. NEC ICT supports "visualization" of the cost of these products..

Big Data Solutions Creating Social Value

NEC-original advanced analysis technologies will use big data solutions to create new social value, with the goal of solving issues such as safe and secure lives, and efficient use of resources.
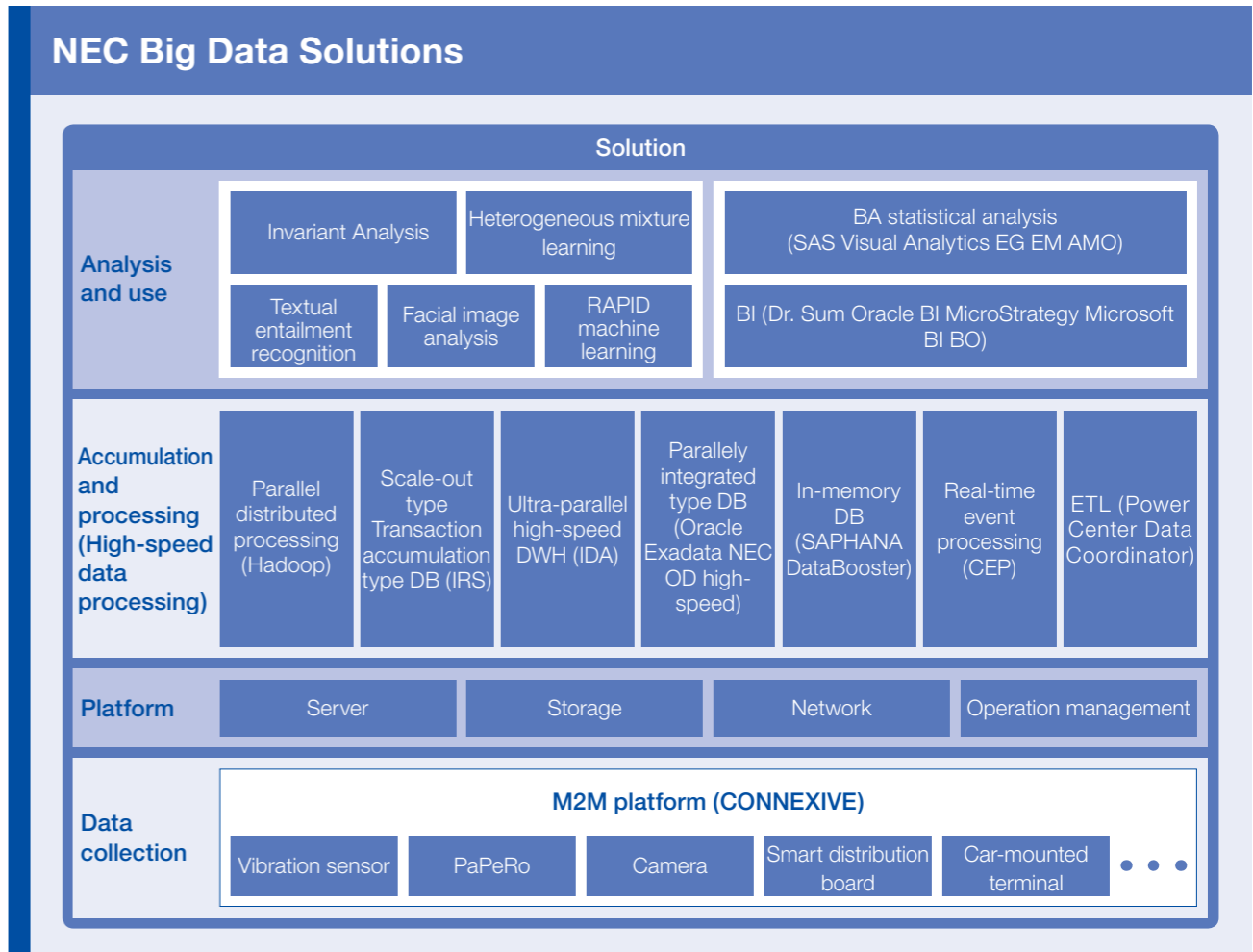
Big Data Analysis that Boasts NEC's Unique Technology

Big data is being effectively used to solve a variety of social issues such as environmental challenges, food production, and efficient use of energy. For NEC, big data is the core of ICT supporting social value along with SDN and cloud services, and a field in which we can contribute to value creation for society from the viewpoint of data usage.
Especially in the area of big data analytics, many NEC-original technologies are being used as the first of their kind in the world. For example, the "Invariant Analysis", which makes the correlation between sensors visible, detects a subtle sign of malfunctions in the early stage, which was not possible with previous methods. This technology is especially useful in predictive malfunction monitoring of vital societal infrastructure such as power plants, roads, and bridges.
One example of "Heterogeneous Mixture Learning technology", which automatically derives multiple regularities from a wide variety of data, is the ability to extract patterns and regularities from a mixture of product purchase data of every store in a convenience store chain, and then predict the sales of each product at each location.
Also, NEC possesses technology that has won first place in worldwide contests, such as "RAPID Machine learning", a method that quickly and accurately pulls matches from massive amounts of data, and "Textual entailment recognition", a method that provides solutions to complex problems based on understanding of full sentence meanings rather than single words.

What NEC Can Do for Customer Challenges

The problems faced in utilizing big data can be lumped into four categories. The first is the method of analysis, in which one does not know what data is necessary or how to analyze it. Next is the problem of cost-effectiveness, where the result cannot be obtained before verification. The third issue is one of manpower such as a lack of persons appropriate for the job. The last one is the issue of privacy, where there is concern over the handling of data that can identify individuals.
NEC focuses on the total cycle when using big data. The purpose of data analysis is identified and small-scale hypothetical testing is carried out first. Then, the results of those analytical results are utilized for specific task improvement.
In "Strategic planning" that defines value, NEC provides the Big Data Discovery Program, a consulting service for support in utilizing big data, along with the consulting service that leverage know-how in the type of industry and task. Next, in "analysis and evaluation service" for value discovery by an analytical expert, the service uses BI (Business Intelligence) tools and data processing engines in a data analysis

NEC Big Data Solutions

	Solution							
Analysis and use	Invariant Analysis	Heterogeneous mixture learning		BA statistical analysis (SAS Visual Analytics EG EM AMO)				
	Textual entailment recognition	Facial image analysis	RAPID machine learning	BI (Dr. Sum Oracle BI MicroStrategy Microsoft BI BO)				
Accumulation and processing (High-speed data processing)	Parallel distributed processing (Hadoop)	Scale-out type Transaction accumulation type DB (IRS)	Ultra-parallel high-speed DWH (IDA)	Parallely integrated type DB (Oracle Exadata NEC OD high-speed)	In-memory DB (SAPHANA DataBooster)	Real-time event processing (CEP)	ETL (Power Center Data Coordinator)	
Platform	Server		Storage		Network		Operation management	
Data collection	M2M platform (CONNEXIVE)							
	Vibration sensor	PaPeRo	Camera	Smart distribution board	Car-mounted terminal	• • •		

NEC-Original Big Data Technologies

- Media processing technology ⇒ Quick, accurate semantic analysis of a variety of real-world situations
- Analytical technology ⇒ Discover new rules, and take optimal course of action from prediction and estimation

World's first	**World's first**
Invariant Analysis	Heterogeneous mixture learning

World's No.1 [*1]	**World's No.1** [*2]
RAPID machine learning	Textual entailment recognition

*1 PTP: Penn Treebank Project 2011 (The world's most famous language processing algorithm contest)
*2 NIST: National Institute of Standards and Technology sponsored test results

NEC's Strengths

- Ability to make proposals that comprehensively support the process from data collection and analysis to system control
- Solution menu that is systematized based on 400 or more business deals
- Analytical technology that discovers new rules and helps take the optimal course of action based on prediction and estimation
- Media processing technology that performs quick and accurate semantic analysis of the real world, such as videos and images

and verification environment. In the last step, "implementation and operation", M2M (Machine to Machine) solutions and various platform products are offered in addition to BI tools and data processing engines.

We collect life logs from social media, a wide variety of data from the sensors embedded in machinery, and then accumulate them on a network for providing powerful support to the execution of existing and new tasks.

Solutions for Four Types of Needs

Customer needs expected to be met by NEC with big data solutions can be summarized in four major areas.

(1)'Accelerated and optimized operation.' Predictive monitoring and maintenance of anomalies in large-scale facilities, improving quality of automobiles and other transportation equipment, enhancing sophistication of safety control for social infrastructure, etc.

(2)'Enhanced information management, crime and fraud detection.' By detecting information that must be managed within a company, information governance is enhanced, fraudulent financial transactions are detected, and security enforcement and monitoring are enhanced.

(3)'Improved product and service value.' By predicting product demand, production and ordering are optimized, and by predicting energy needs, cities are turned into 'smart cities'.

(4)'Customer acquisition/maintenance, and sales promotion.' Sales promotion through product and service matching, customer acquisition analysis of point and coupon effectiveness, and enhanced marketing through traffic pattern analysis.

To solve issues in the four areas mentioned above, NEC has systematized products, services, and solutions such as NEC Big Data Solutions for effective use of big data. Business system support for data usage and personnel training are also available from NEC Big Data Support Structure.

Case Study	Obayashi Corporation

Heterogeneous mixture learning used to verify high-precision predictions of building energy demands

It is said that energy demand will become 1.8 times as big as it is today for large cities in the near future. The Obayashi Corporation and NEC jointly carried out a big data verification test in order to efficiently use renewable energy in the city.

Renewable energy can be used efficiently and without waste by accurately estimating energy demands and adjusting energy consumption and storage. However, because demands fluctuate for various reasons, it is very difficult for any individual to predict it based only on his/her experience or intuition. Obayashi Corporation, in their efforts to use energy efficiently, required high-precision prediction of energy demands.

To that end, they introduced NEC's heterogeneous mixture learning technology, which provides high-precision prediction of energy demands by automatically classifying optimal patterns and discovering regularities,.

For power demands prediction, power, air conditioning, weather, and operation day count data for the past two years stored at Obayashi Technical Research Institute were used. As a result, high precision 24-hour or 1-month prediction of power usage amounts and air conditioner energy consumption was made possible, which resulted in an estimated 20% reduction of power usage utilizing a total control method including the use of big data to predict power needs. Obayashi Corporation plans to use this technology initially in factories, schools, hospitals, and other buildings and expand it to the redevelopment urban areas and building a smart city over a wider area.

Obayashi Corporation uses data on the weather and movement of people to accurately predict power demands for efficiently use of energy. Because multiple prediction methods are used to automatically extract prediction formulae from a massive amount of data, high-precision prediction is possible even without a specialist.

NEC's Heterogeneous Mixture Learning Technology Uses the Optimal Prediction Formula to Extract Items from Massive Amounts of Data

One strength of heterogeneous mixture learning technology is automatic classification from a vast amount of differing types of data. A challenge that originally existed was the classification work entailed in deriving the appropriate prediction formula. When the conditions and causes necessary for prediction are multiplied, the result is a massive number of classification patterns. However, NEC technology automatically sifts causes and conditions, combines them, and derives the appropriate classification and predictive formula Analytic solutions do not end with a high-precision prediction. Customers want to utilize the prediction results for various operations. However, because the machine learning algorithm has a portion where the prediction formula that is a learning result is a black box,, it is not useful in store and product strategy, maintenance, improvement, and operational improvement. NEC's heterogeneous mixture learning technology analysis engine is not only capable of high-precision prediction, but also makes classification conditions and prediction formula details visible, making it useful in improving operations. A track record of verification testing and trials in a wide variety of fields such as construction, logistics, energy, public sectors, and finances is one of the advantages of this technology. We can offer analysis that uses case studies from other fields by systematizing and collecting analysis methods that can be used when necessary.

Yosuke Motohashi, Assistant Manager of NEC Big Data Strategy Division and Knowledge Discovery Research Laboratories

Contributing to Value Creation for Customers with Big Data Analysis and Utilization

The NEC Big Data Discovery Program is a support service that identifies the purpose and analysis methods of data usage along with customers who are considering creation of a new business, increasing sales, and improving tasks. The following three steps are carried out as a standard procedure in this service. In phase 0 (envisioning), the aims of analysis and purpose of use are identified. Next, phase 1 (hypothetical planning) data is checked and a hypothetical plan for data use is worked out. Then, in phase 2 (analysis verification), the actual data is used for analysis. Because NEC business covers an extremely wide range, from satellites to submarine cables, data usage case studies in every field can be used as a catalyst for actual big data analysis.

NEC also provides customers with consulting on staffing and organizational design with our knowledgeable analysis and domain experts. As big data analysis will be further demanded in the future, NEC will endeavor to create exciting new data usage scenarios.

Yuri Sato, Senior expert of NEC Big Data Strategy Division

Total Cloud Solution Contributing to Innovation of Society and Business

With the technical and operational abilities cultivated in various solutions and services, along with strength in platform products, NEC can solve the new issues of the cloud era and contribute to social and business innovations.
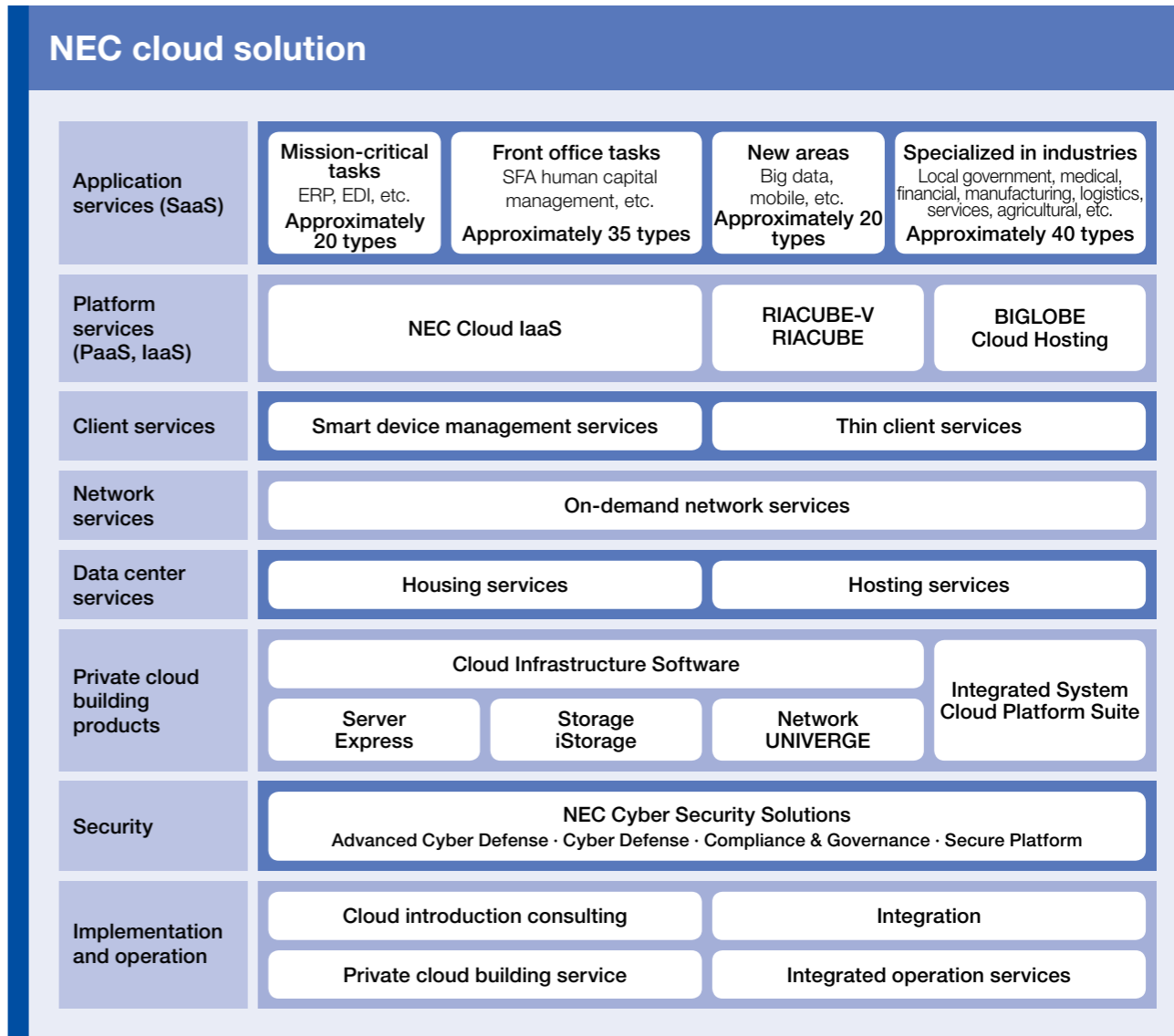
Various options and customer needs when introducing cloud environment

The adoption of cloud systems or services is steadily proceeding in the ICT environment. There are a variety of ways of adoption, such as building a cloud environment with server integration and virtualization by a company itself on premises (at company's facilities) or at an external data center, or using an external ready-made cloud environment as services. In fact, however, some customers have difficulty proceeding with cloud because there are so many subjects they may need to put into cloud, ranging from infrastructure to applications, that they cannot easily make a right decision. When company executives are considering use of cloud services, cost optimization, business continuity, and security are important factors. Additionally, there are expectations for higher speed, more flexibility, and expandability of the cloud.

What deployment of cloud services means to information systems departments at companies is that traditional in-house individual systems are gradually migrated to an internal or external cloud environment. This creates a new type of need for organically and efficiently integrating, managing, and operating the hybrid ICT environments in which legacy systems and internal/external cloud systems coexist.

Shifting from efficiency of existing systems to social and business innovation

When looking at the history of the use of clouds in business, one will find that it started with infrastructure such as servers, collaborative areas such as e-mail and groupware, and areas such as sales force support tasks. Currently, however, clouds are being used also in industry-specific and mission-critical tasks.

NEC has a service menu with over 100 items including applications and platforms to meet a variety of customer needs, every kind of product required for building a private cloud, and integration and operation services for introducing a cloud environment. Because NEC's scope of business covers a variety of industries, tasks, and scales from private enterprises to public institutions, we can offer the optimal solution for any industry and task. Applications and a supporting infrastructure are important for establishing a company's competitive edge or providing better services from a public institution. Should a cloud service be selected to match the characteristics of the task or application, or should an original application be developed on a cloud infrastructure? In either case, by leveraging cloud advantages such as speed or scalability, it is effective to start on a small scale with limited features and services, verify the effectiveness and then expand functionality or scale. This method adds speed to social and business innovation and helps realize goals.

NEC cloud solution

Application services (SaaS)	Mission-critical tasks ERP, EDI, etc. **Approximately 20 types**	Front office tasks SFA human capital management, etc. **Approximately 35 types**	New areas Big data, mobile, etc. **Approximately 20 types**	Specialized in industries Local government, medical, financial, manufacturing, logistics, services, agricultural, etc. **Approximately 40 types**
Platform services (PaaS, IaaS)	NEC Cloud IaaS		RIACUBE-V RIACUBE	BIGLOBE Cloud Hosting
Client services	Smart device management services		Thin client services	
Network services	On-demand network services			
Data center services	Housing services		Hosting services	
Private cloud building products	Cloud Infrastructure Software			Integrated System Cloud Platform Suite
	Server Express	Storage iStorage	Network UNIVERGE	
Security	NEC Cyber Security Solutions Advanced Cyber Defense · Cyber Defense · Compliance & Governance · Secure Platform			
Implementation and operation	Cloud introduction consulting		Integration	
	Private cloud building service		Integrated operation services	

NEC's Strengths

· Cloud integration and Integrated operation to optimize the diversified cloud environment
· Variety of service menus to cover system scales, industries, and tasks for customers
· Products and solutions for achieving on-premise and hybrid cloud environments
· High-performance, highly reliable cloud infrastructure services with speed, flexibility, and expandability
· Efficient, safe, and secure hybrid (cloud and housing) data centers

Comprehensive capability for meeting varied customer needs

In addition to a longtime track record of system integration and outsourcing projects, NEC possesses all layers of progressive cloud technologies such as hardware, software, networking (SDN), and data centers. To support new businesses, we provide cloud services for big data, M2M (Machine to Machine), HEMS (Home Energy Management System), image recognition, content distribution, smart devices, and more. We are also adding services in the area of social solutions.

In the area of cloud infrastructure, we provide solutions that organically link cloud services and on-premise systems, including NEC Cloud IaaS, a service for providing high-performance and excellent reliability along with speed, flexibility, and expandability, and Cloud Platform Suite, an integrated system that helps easily build an on-premise private cloud environment.

In addition to using NEC's own products that have a proven track record in the area of mission-critical tasks, we use OpenStack open-source software to provide an open cloud environment and feed the latest technologies back to customers. Regarding security, NEC's dedicated in-house organization, NEC CSIRT (Computer Security Incident Response Team) and the Cyber Security Factory provide support, and, by building strict internal controls for example, we have established a system that can provide safe and secure services to customers.

From here on, NEC will continue to contribute to social and business innovations through enhanced cloud infrastructures, global expansion, and expanding cloud services that support social solutions, along with the customers.

| Case Study | Universal Studios Japan® |

Improving customer satisfaction with an electronic money system: Making a more advanced service possible by collecting purchase history data

The Universal Studios Japan theme park has been providing world-class entertainment since opening in 2001. The managing company, USJ Co., Ltd. uses NEC Integrated E-Money Solution to provide Wonder Money, an electronic money system on smartphones for exclusive use within the park. Upon introduction, it helped to alleviate crowding at registers and reduced stress of visitors. The turnover was improved as well and it resulted in more purchasing opportunities. The amount of money spent inside the park also increased.

NEC also caters for the needs to improve service and offer a more advanced service to customers by collecting and using customer purchase history data. In the future, USJ plans to provide coupons that match customer preferences and deliver a variety of services such as contents distribution. There are also future plans to offer to visitors an environment where they can enjoy everything in the entire park with a single smartphone.

NEC solutions are provided as a service, electronic money service can be deployed in a speedy fashion. It can also flexibly expand system to meet the needs as the number of customers' increases. This is just one example of an advanced social solution that enables a rapid deployment of a new service for people.

® Universal Studios.   © 2014 Peanuts Worldwide LLC   CR14-3772
NEC is an official marketing partner of Universal Studios Japan®.

NEC, a vendor with all necessary assets, provides total support for customers.

NEC positions cloud infrastructure as the innovation platform in which we provide social solutions and contribute to society by organically linking our strength in system integration (SI) with ICT technologies and products. We actively look for feedback from customers, and provide this information to our ICT technology and products divisions as technical requirements from the standpoint of safety, security, efficiency and equality in achieving social solutions. Then, we implement cutting-edge technologies on our cloud infrastructure in order to trigger breakthroughs in solving social issues. The expertise and know-how we obtain is used for the next SI projects. This is all made possible by our track record of embodying the high level of reliability and security requirements in SI demanded by customers in the financial and telecommunications fields as well as government agencies, and our experience in solutions development for customers in other industries, and NEC assets that cover every layer from applications to data centers.

NEC also provide the one-stop solution including on-premise and housing environments. Even when unexpected circumstances arise, we address issues while understanding the inner workings of the target system so that investigation of the cause and quick, accurate countermeasures are possible. Through my experience in SI and operation service departments, I have a firsthand feeling that total support is important for cloud infrastructure, and have heard the same from customers. This is proof of the advantages of a total vendor like NEC. We want to actively develop and globally expand positive growth cycles as shown in the diagram below, and contribute to society.

Hidenobu Azeta,
Principal Strategist,
C&C Cloud Infrastructure
Strategy Division,
NEC Business Innovation Unit

Cloud infrastructure organically linking NEC advantages

\Orchestrating a brighter world

Social Solution

Verification, expertise, and know-how — Providing integration that creates social value

Feedback — Improving safety, security, efficiency and equality in technology

System Integration

Cloud Infrastructure (NEC Cloud IaaS/ on—premise products)

ICT technologies/ products

Customer feedback — Demands for solutions that create opportunities for customer growth

Providing cutting-edge technology — Breakthroughs in social issues with cutting-edge technology

>>> SDN Solutions

Simple Solutions for Network Issues

SDN makes network communications flexible, efficient, and safe, providing the advanced Infrastructure necessary to enhance social systems. NEC SDN solutions solve ICT issues.

Management Issues Related to ICT

Introducing a sophisticated ICT system is indispensable for swiftly implementing and flexibly supporting management policies, as well as enhancing adaptability to business changes. However, traditional networking equipment and technology sometimes cannot keep pace with the needs of an advanced, complex ICT system. Because it can take time to construct infrastructure and systems, companies may lose the opportunity to pioneer a new business or service. Additionally, launching into overseas markets or expanding business can complicate networks between branches, leading to reduced efficiency in network usage and increased security risks. Expectation is growing for SDN (Software-Defined Networking) as an approach to solve these issues and meet customer demands for introducing and building ICT systems more freely and flexibly. SDN is already playing an important role as infrastructure in the real world, achieving implementation of ICT and new services in businesses.
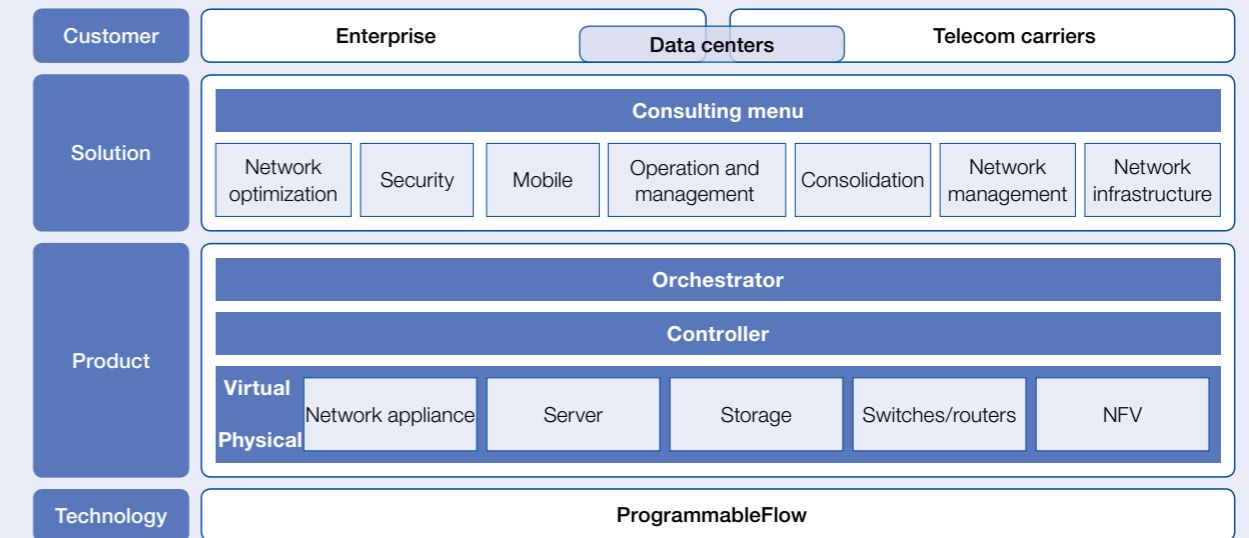
Realizing Simple and Flexible Infrastructure Through SDN

NEC defines SDN as the dynamic control of networks by software as well as the mechanism, concept, and architecture of such networks.

In SDN, network control and data transfer processing are decoupled, and the network section is dynamically controlled by software to realize simple and flexible infrastructure. In recent years, IT systems except networks have come to be dynamically controlled or optimized through virtualization technologies. Before SDN, networks that could not be dynamically controlled hindered the optimization and efficiency of the overall ICT system. Even when individual IT devices were optimized, the network connecting the devices became an obstacle to processing data more efficiently.

Deployment of SDN enables precise and tangible realization of benefits such as suppressing failures, improving infrastructure efficiency, making the overall ICT system
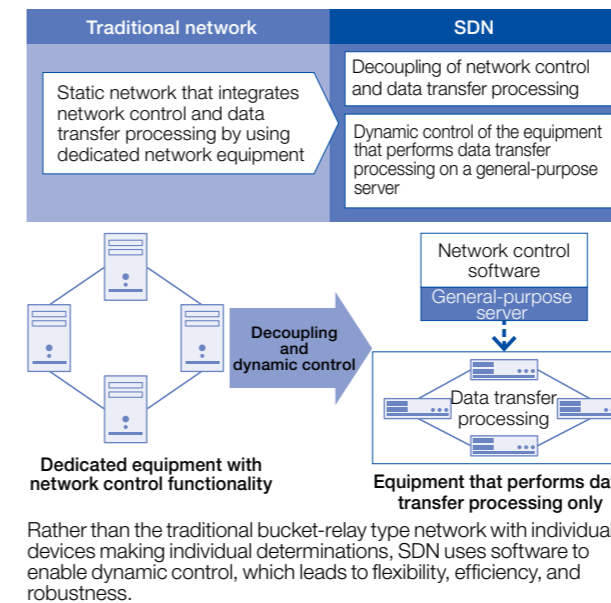
Providing SDN Solutions to a Wide Range of Customers, from Enterprises to Telecom Carriers

NEC has developed a rich lineup of SDN products which we are now providing in solution form to a wide variety of customers based on our excellent record of advanced solution implementation.

NEC counts organizations from various fields among its customers, from enterprises to data centers and telecom carriers. Our SDN solutions are achieved by leveraging our longtime experience in fusing communications and IT and our highly reliable networking, mission-critical, and virtualization technologies. NEC creates new value based on the concept of "simple & flexible."

Customer	Enterprise		Data centers	Telecom carriers		
Solution	Consulting menu					
	Network optimization	Security	Mobile	Operation and management	Consolidation	Network management	Network infrastructure
Product	Orchestrator					
	Controller					
	Virtual / Physical — Network appliance	Server	Storage	Switches/routers	NFV	
Technology	ProgrammableFlow					

Benefits of SDN

Traditional network	SDN
Static network that integrates network control and data transfer processing by using dedicated network equipment	Decoupling of network control and data transfer processing
	Dynamic control of the equipment that performs data transfer processing on a general-purpose server

Network control software
General-purpose server
Data transfer processing

Decoupling and dynamic control

Dedicated equipment with network control functionality

Equipment that performs data transfer processing only

Rather than the traditional bucket-relay type network with individual devices making individual determinations, SDN uses software to enable dynamic control, which leads to flexibility, efficiency, and robustness.

visible, improving security, optimizing ICT resource distribution, and optimizing social infrastructure and the ICT systems supporting it.

SDN is also gaining attention on an international level as a means of achieving advanced ICT that can quickly and flexibly adapt to social and market changes.

NEC's Strengths

- · Extensive experience and expertise in networking and IT systems
- · Industry-beating record in introducing SDN to customers, including public offices and business customers
- · First in the world to develop, commercialize, and apply SDN products
- · Owner of advanced technologies through early participation in global standardization activities and SDN research

Track record

FY2012	FY2013	FY2014
100	150	200 more

(Cumulative Total Value)
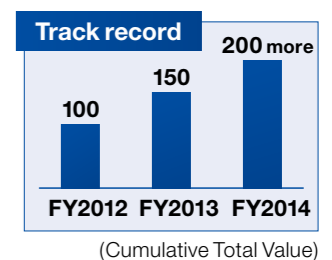
Creating a Better Society Through SDN

NEC is one of the few companies with world-class technological capabilities in both IT and networks and many use cases in commercial environments. Focusing on the possibilities of SDN from early on, NEC took part in Stanford University's Clean Slate Program aimed at the development of an SDN architecture from the initial stages (January 2008). NEC was the first in the world to offer SDN products and already boasts an extensive track record with deliveries of more than 200 systems.

Our SDN solutions are achieved by leveraging NEC's longtime experience in fusing communications and IT and our highly reliable networking, mission-critical, and virtualization technologies. Through SDN, NEC creates new value based on the concept of "simple & flexible."

Understanding that successful SDN implementation does not stop at technology or product development, NEC has also established a department specialized in sharing vital knowledge and fostering engineers with skills to integrate IT and networks and develop SDN solutions that meet customer needs. By 2015, we aim to expand our SDN sales training and increase the size of our SDN sales force from the current 800 personnel to about 2,000, including sales partners.

NEC will continue to develop, implement, and propose advanced SDN solutions to customers throughout the world.

Case Study	JR EAST

Greater Convenience, Safety, and Comfort in Stations : SCN Accelerated New Services Deployment

At Tokyo Station, East Japan Railway Company (JR EAST) previously operated several separate networks to manage train service reporting, security cameras footage, and other data dependent services. This made managing their operations complicated and cumbersome, and it soon became difficult to introduce additional services. JR EAST addressed this issue by adopting NEC's integrated station network solution that utilizes SDN (Software-Defined Networking) technology. Tokyo Station now provides JR EAST staff and its customers with a smart wireless LAN environment which offers a host of real-time services-from train delay alerts to the availability of luggage lockers. Information services for shopping facilities (known as 'ekinaka') are scheduled to be integrated into the station network solution, where everyone who uses Tokyo Station will have the ability to access a wider variety of the station's information services in a timely, convenient and easy manner.

SDN USAGE BY JR-EAST

SDN USAGE BY JR-EAST

Enables Speedy Provision of New Services

Wireless LAN | JR-EAST apps for smartphones | Lockers | Provision of information to station personnel | Congestion detection using IP cameras | Portable displays

Common Station Network

NEC UNIVERGE PF Series

Thanks to the SDN-based common station network, it is now possible to quickly implement ideas for new services

The in-station shared network made possible by SDN enables swift materialization of new service concepts.

Leveraging Our Track Record to Expand the SDN Market

NEC contributes to solving social problems around the world by creating more sophisticated social infrastructure through ICT. SDN technology is key to utilizing NEC's ICT assets related to cloud and big data services.

It is generally understood that SDN is used in technologically advanced places such as data centers, telecom carriers, and research institutions. However, NEC has delivered over 200 SDN systems to customers engaged in many different types of business, including public offices, companies, and universities.

SDN is not limited to specific industries or business and has proven to have a range of applications. We have noticed from our experience that it is particularly suitable for customers who are engaged in frequent network reconfiguration. SDN significantly reduces the workload involved in changing network configurations and managing operations in places such as commercial complexes where tenants are frequently reshuffled or companies expanding their business through M&A.

However, many customers still believe that the heavy workload involved in network operations management is unavoidable. For more customers to adopt SDN solutions, it is not enough to simply propose products. Customers need to be provided with accurate information on the benefits of using SDN. We have therefore systemized a NEC SDN Solutions menu that includes both products and system building technologies in carefully selected areas of high cost effectiveness. Our policy is to continue to expand this menu by offering solutions to advanced customers.

We also actively train our sales staff and system engineers so that they can propose and implement SDN solutions. In our role as an SDN solution leader, we are in an excellent position to maintain our competitive edge in this market by leveraging our track record and superior SDN solutions to appeal to an even wider range of customers.

Jiro Kitakaze, Deputed General Manager of Solution Platform Business Division, NEC System Platform Business Unit

NEC SDN Case Studies as of August, 2014

Market			
Enterprises	· Nippon Express Co., Ltd. · Kanazawa University Hospital · Minaminihon Information Processing Center Co., Ltd. · BIGLOBE · TV Asahi Corporation · Toyo Seikan Group Holdings Ltd. · East Japan Railway Company	· Nippon Jimuki Co., Ltd. · West Nippon Expressway Company · Nagoya City University Hospital · NS Solutions Corporation · Ministries and public offices · Research institution · Logistics companies · Manufacturers	· Electronics manufacturers · Trading companies · System integrators · NDDI (United States) · Stanford University (United States) · Marist College (United States)
Telecom carriers	· NTT Communications "Biz Hosting" · Myanma Posts and Telecommunications · Telefonica (Spain) * · Portugal Telecom (Portugal) * · Cricket Communications (United States) * · GenesisHosting (United States) **		* Undergoing operations testing ** Service provider

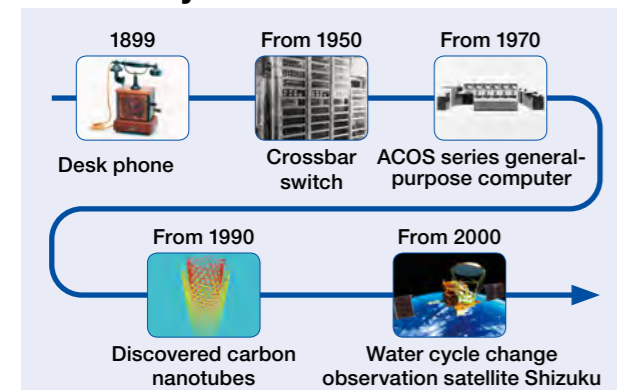**Over 200 systems in operation at various enterprises**

NEC's SDN products are currently being used and verified in over 200 systems in many different enterprises. Mainly in developed countries, but in the rest of the world as well, we have achieved actual operation of SDN systems in a wide range of enterprises.

NEC Business Structure

Innovative efforts for over 100 years

On July 17, 1899, the NEC Corporation was established as a joint venture company with Japan's first foreign capital (Western Electric, USA, currently Alcatel-Lucent).

With the slogan "Better Products, Better Services," we have continued to strive to provide customers with ever better products and services and built our history of innovations in the field of information and communications technology (ICT). Throughout its history, NEC has continuously provided innovative technologies, including many world-first technologies and R&D, as well as management reforms that made technological innovation possible and environmental activities, all of which were always ahead of the times.

In April 2013, NEC declared to transform into a "Social Value Innovator" in the Mid-term Management Plan 2015. By solving social issues, NEC aspires to achieve the coexistence of both customer value and social value. From here on, NEC will continue to provide Better Products and Better Services from each and every business unit. NEC has a history of more than 100 years since our founding, and we believe that our transformation to become a social value innovator will build a sound foundation for the next century of our growth.

NEC history

| 1899 | From 1950 | From 1970 |
| Desk phone | Crossbar switch | ACOS series general-purpose computer |

| From 1990 | From 2000 |
| Discovered carbon nanotubes | Water cycle change observation satellite Shizuku |

NEC Business Operation Structure

Business unit overview

Public Business Unit

Social infrastructure solutions business including broadcast/control systems, and aerospace/defense systems.
IT services, including consulting, system integration, operations, maintenance, and outsourcing management.

Enterprise Business Unit

IT services, including consulting, system integration, operations, maintenance, and outsourcing management.

Telecom Carrier Business Unit

Sales, systems integration (SI) services, hardware and software development for telecommunication/service carriers.

Smart Energy Business Unit

Businesses for energy suppliers, businesses related to energy, such as electricity storage systems.

Global Business Unit

Sales of NEC products and services to overseas customers in collaboration with overseas group companies.

System Platform Business Unit

Computer (open servers, mainframes, HPC, storage, workstations, etc.) products business, software (OS, SI infrastructure) products business and support services. Network solution business for enterprise customers.

Business Innovation Unit

Big Data, SDN(Software-Defined Networking), Cloud, Cybersecurity, Corporate Business Development, Corporate Technology Strategy, and Corporate Marketing.

Corporate Sales and Sales Operations Unit

Overseeing and promoting sales as well as training and managing sales staff of the entire company. Sales units across Japan (branch offices) with the function of promoting partner business. Promotion of business for medium-and small-sized companies.
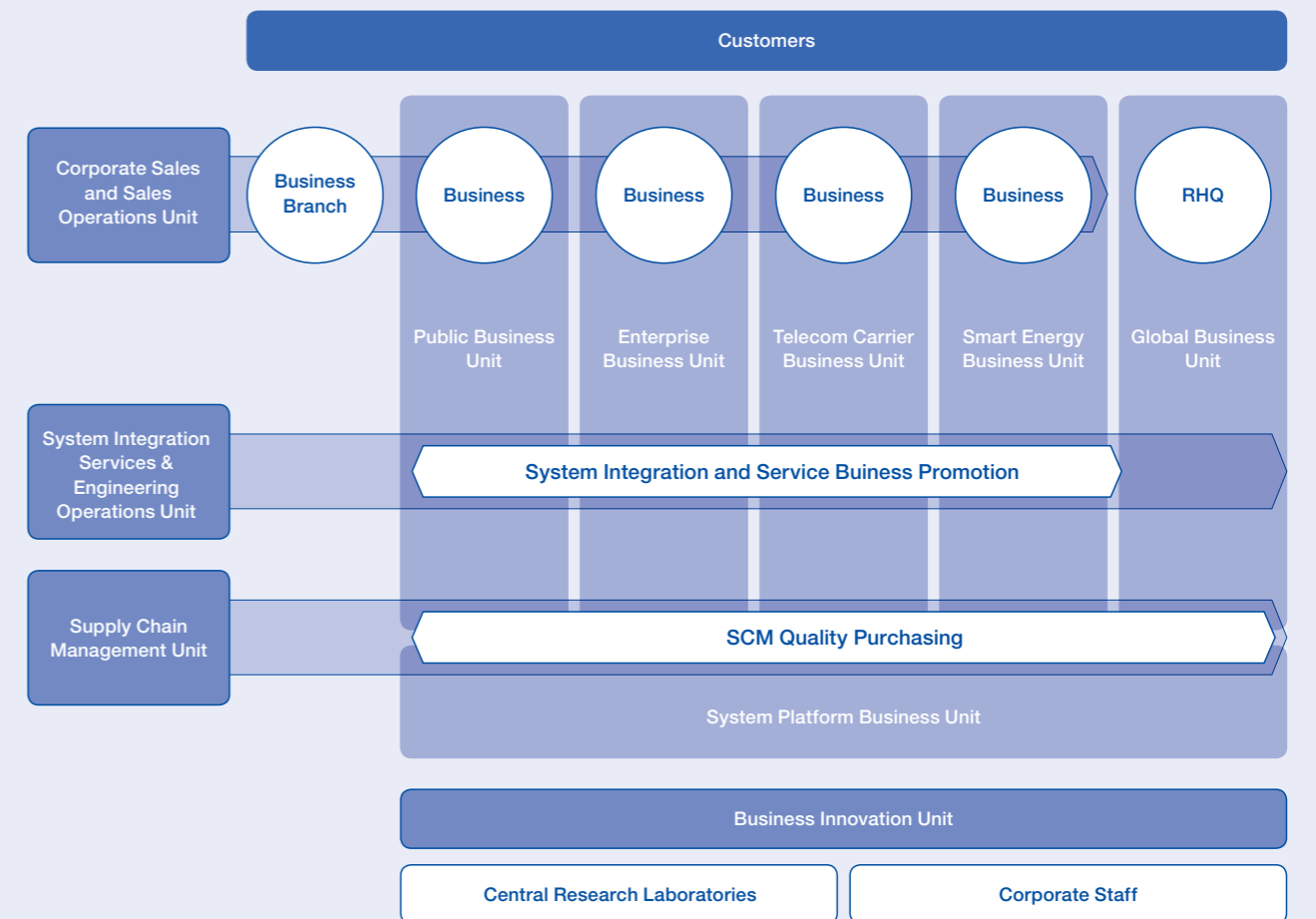
System Integration, Services & Engineering Operations Unit

Advanced SI technology development, engineering activities for SI and services, creating and providing common and integrated solutions across all industries.
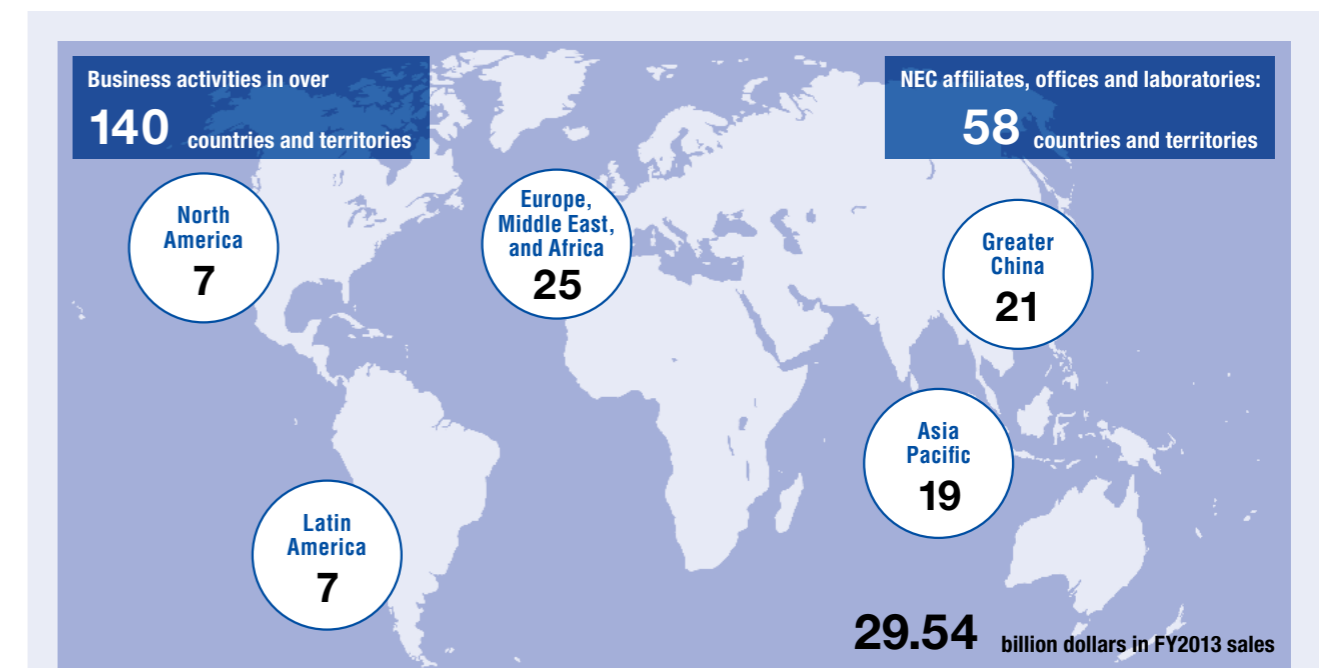
Supply Chain Management Unit

Enhancement of production systems, global distribution systems, and procurement capability of NEC group.

Organization Chart

NEC Worldwide

Business activities in over 140 countries and territories

NEC affiliates, offices and laboratories: 58 countries and territories

North America **7**

Europe, Middle East, and Africa **25**

Greater China **21**

Asia Pacific **19**

Latin America **7**

29.54 billion dollars in FY2013 sales

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