Orchestrating a brighter world NEC

White Paper

Future Telecommunication with NEC the WISE

NEC Artificial Intelligence and Telecommunications; to Innovate Communication

Challenges

As service providers, Telecom Operators are constantly evolving to deliver a wide-variety of communication services, tools, products, and solutions; from providing basic services, to advancing technologies and researching new ideas. In such, business environments of telecom operators are influenced by technology trends, consumer preferences and business eco-systems, enveloped within a social network of challenges.

- Complexity: Employing advancements such as GE-PON, LTE, and SDN / NFV[1] telecom operators deliver the latest technologies, meanwhile subscribers expect to use services everywhere, without restrictions. This requires that the supporting infrastructure (access points, cell sites, networking equipment, etc.) be deployed and maintained, expanded, and improved across the operating areas. This puts telecom operators' network and services under high scrutiny with increasing complexity.
- Diversification: From its advent over fifty years ago, the number of internet users has increased exponentially. Exceeding 3.6billion users as of 2016[2]; representing over one-third of the world's population. These consumers collect and contribute massive amounts of information over the internet including emails, websites, voice, music, and videos, having unique preferences, policies, beliefs and interests.
- Reliability: Rapid advancements in technology and communication affect industries dramatically. The latest technology: IoT[3], involves the collection of data from real world interactions. With data collection evolving past a digital space penetrating the physical world, consumers begin to realize the risks involved in data collection. As customers become more cautious of the services, they move to more reliable companies to entrust their confidential data, including telecom operators. These service providers hold a position in which to treat sensitive information as a valuable asset to generate new values from data.

[1]GE-PON: Gigabit Ethernet-Passive Optical Network
LTE: Long Term Evolution
SDN:/NFV: Software-Defined Networking/ Network Function Virtualization

[2]Source: ITU World Telecommunication/ ICT Indicators database (http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx)

[3]IoT: Internet of Things

Artificial Intelligence and NEC the WISE

Telecom operators typically operate via teams of employees, using accumulated knowledge and experiences who manage their networks and services. However as business speed accelerates and technology changes, telecom operators have difficulties keeping up and delivering new services. To this end in July 2016, NEC announced "NEC the WISE", a cutting-edge AI technologies portfolio readily available to support the telecommunication industry.

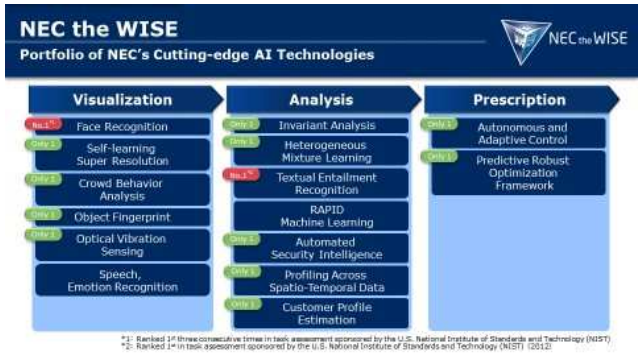


Figure 1: NEC the WISE

AI (Artificial Intelligence) refers to technologies that computerize human intellectual activities. For more than half a century NEC has researched and developed AI, successfully producing practical applications and innovative solutions from our many achievements. Our goal is to collaborate with our customers, facilitating cooperation between people and AI, as we continue to leverage our accumulated knowledge and wisdom of experience to solve the increasingly complex and sophisticated problems that society confronts.

NEC the WISE is designed to enrich human intellect and creativity by emphasizing cooperation between people and AI. Improving big data utilization and delivering practical solutions enabling advanced data analysis, contribute to the transformation of enterprises and society and provide a new levels of decision-making support.

NEC the WISE covers all aspects of *Visualization*: capturing and converting data from the real-world into accessible digital information; *Analysis*: dissecting huge volumes of data to discover hidden knowledge, patterns and rules; *Prescription*: providing suggestions for multiple solutions to a problem. These technologies can be combined and tailored to match specific needs, increasing capability and applications to further value.

AI x Telecommunication

NEC's business originated from the development of the PSTN (Public Switched Telephone Network) in Japan over a century ago. Since then, NEC has continued to invest in network technologies in the telecommunications field, expanding its reach globally. NEC delivers wide-array of network solutions and services including Fixed Network, Mobile Network, TOMS (Telecom Operators Management Systems) and SDN/NFV to telecom operators in over 150 countries.

With over 50 years of R&D in the field of AI, NEC has delivered more than 15 successful AI technologies. The first notable achievement in visualization technology, an OCR (Optical Character Reader), was applied in business applications in Postal Address sorters in the 1960's. Through steady commercialization of AI technologies, NEC has developed over 500 cross-industry use cases and built analytic technologies acquiring and providing knowledge for analysis of varying types of data for a wide-range of purposes. NEC's powerful AI technologies, history and experience in the field of telecommunication networks and services, emphasize NEC's continuing commitment to enhance and support telecom operators. NEC is the only entity which can successfully develop, deliver, and maintain data analytics in the telecommunications industry.

Figure 2: Data Utilization Map

Figure 2 above shows a representation of a data utilization map based on NEC's use cases from collaborations with telecom operators. Reflected across two axes, Business/Data Area is horizontal and Analytic Purpose is vertical.

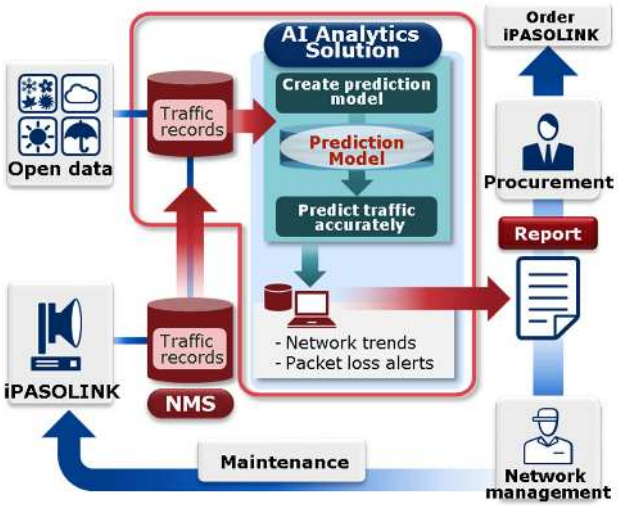
NEC's AI solution use cases can be categorized in five areas which include improving service quality and enhancing data value. All use cases are eventually mapped in this data utilization area, regardless of any differences in use cases such as regions or business models of telecom operators. There are two major areas when mapping, business process to enable network functions enhancement with AI and digital business to jointly approach markets by data value enhancement.

Business Process Innovation: Enhanced Network Management and Advanced Customer Retention

Through adopting NEC AI technologies several target points for improving Telecom Operators' workloads and business efficiency were found. By applying a use case in which such technologies are utilized, our clients receive merits directly, such as contact center service, planning of investment, etc. The following introduces two of NEC's use cases.

Use case 1: Enhanced Network Management

Given the increase in the number of mobile service subscribers and upgrades in network technologies (such as LTE and 5G), telecom operators are required to install and expand their network equipment in mobile backhaul areas continuously. As more cell sites are installed, the number of backhaul equipment increases. However, the growing popularity of data-services, such as video streaming, requires better network quality, reduced packet-loss and low-latency.



NMS: Network Management System

Figure 3: Enhanced Network Management

Meanwhile, telecom operators also need to manage investment efficiency in covering growing cell site coverage for delivery of services. Typically network management and investment planning are still performed manually, resulting in inefficiency. Current management models of mobile backhaul await proposals of new effective maintenance schemes. NEC named a model to improve investment efficiency and customer satisfaction for mobile backhaul management by using AI technologies for Enhanced Network Management, iPASOLINK.

Operation teams and Planning/Procurement teams in Telecom Operators pay attention to QoS and investment efficiency to deliver best service qualities for their subscribers. To satisfy their clients, they try to minimize packet loss in the network each time such packet loss is detected. Using AI technologies, NEC proposes to support Operation and Planning/Procurement teams work effectively by assisting in "understanding traffic patterns in detail" and to "take an overall view of trends" through:

- Supporting network management of several thousand devices by traffic-pattern-based clustering and accurate traffic prediction (Over 90% accuracy).
- Reducing operator workloads during network optimization for a large number of devices
- Enabling evaluation of network activities for optimal performance
- Maximizing investment efficiency while maintaining QoS

Use case 2: Advanced Customer Retention

Acquiring new subscribers and preventing existing subscribers to churn out are two important activities for all Telecom Operators. Delivering campaigns or special offers to subscribers and enterprises is the typical approach. However, to decide target subscribers and consider effective measures, telecom operators have to deal with an enormous number of subscribers in the millions.

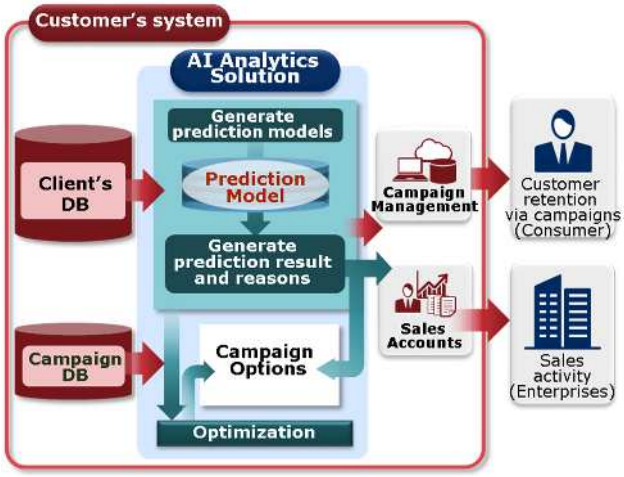


Figure 4: Advanced Customer Retention

For consumer business, customer retention consists of finding out who will churn and what will change their mind and/or why. NEC's AI helps identify future churners with more enhanced accuracy and optimize campaigns delivered to potential churners. In actual business cases, NEC showed highly accurate churn prediction; over 8 times for lift number and over 2.4 times for ROI maximization through campaign personalization.

It is also important that sales agents attract client companies by creating special proposals based on client demands and feedback; accurate churn prediction with clear reasons are required for enterprise marketing, criteria which NEC's AI technologies can meet.

Further Collaboration between AI and Telecommunication

The development of Telecom Operators' network and services is based on the development of the data and control planes. In the data plane, thousands of equipment operate in a network, including access, backhaul, transport, metro, and core. NEC's AI technologies will provide solutions to resolve challenges, such as making more dynamic traffic

engineering, effective network maintenance, and optimizing traffic latency and packet loss, in high complexity networks.

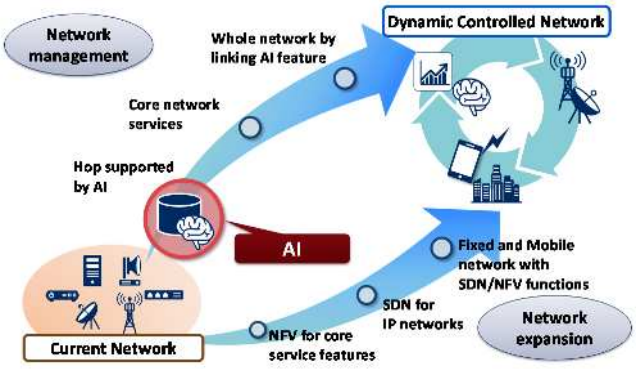


Figure 5: Towards Dynamic Controlled Network

To support highly diversified consumers and enterprises, telecom operators make more personalized services by using highly flexible networks as a control plane above the data plane. To find ways to make personalized services, including personalized VPN, flexible centrex services, and enterprise cloud with secured network services, NEC's AI will assist in delivering more pliable and effective services with Dynamic Controlled Networks. To deliver IoT services, big data in varying forms is collected from real-world environments. Through reliability in providing secure services and obtaining higher credibility from subscribers, telecom operators will be able to handle increased volumes of data with a deeper range of information. Through combinations of personal information and user statistics alongside open data collected from the internet, completely new information and knowledge can be discovered. By supplying such new resources, NEC will become the center of a business eco-system which delivers completely new solutions and connects multi-service providers with these services. Dynamic Controlled Network with AI helps telecom operators innovate communication. Through steady expansion adopting these new technologies, Business Process Innovation leads Telecom Operators to more efficient networks and services.

Digital Business Innovation: Driving Digital Transformation

NEC holds an unique position to provide technologies of both AI and telecommunication, and to deliver combined solutions. Telecom Operators also have the unique position to deliver multiple personalized digital services with high reliability to subscribers. The collaboration between the technology vendor and service providers drive digital transformation of cross-industry communication (i.e. AgriTech, FinTech, BioTech, HealthTech, etc.). For telecom operators, helping to create social values to support social infrastructures with Artificial Intelligence and Telecommunications.

Figure 6: Driving Digital Transformation

About NEC

NEC is a global leader in the integration of cutting-edge technologies in computing, networks and software, building solutions that benefit governments, businesses and people worldwide. NEC brings more than 100 years of expertise in innovation, providing solutions for society that promote the safety, security, efficiency and equality of society. As embodied in our corporate brand statement "Orchestrating a brighter world," NEC aims to help solve a wide range of challenging issues and to create new social value through driving digital transformation for the changing world of tomorrow.

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