

## Software-Defined Networking (SDN) Solution

## East Japan Railway Company (JR-EAST)

### Challenges

- The networks had been built separately on an as needed basis, creating jumbled wiring, a complicated infrastructure and heavy workloads when adding or modifying a network.
- A highly robust, “non-stop network” was required for Tokyo Station.
- Follow a phased, methodical construction approach during offpeak hours.

### Solution

- NEC’s Software-Defined Networking (SDN) Solution enables network simplification, secure integration and easier control.
- NEC’s UNIVERGE PF Series made it possible to construct a logically independent VTN.

### Results

- NEC has built a common station network and robust IT infrastructure for JR-EAST, successfully improving the quality of service at Tokyo station.
- The foundation is in place to quickly provide a variety of service and solutions across the rail networks.
- SDN makes it possible to have a centralized control of networks and to rapidly make additions and changes, resulting in shorter construction periods and reduced workloads.

Railways in Japan are a major means of passenger transport. Japan’s leading railway company is JR-EAST, which carries out railway operations and lifestyle service businesses in Eastern Japan and throughout the Tokyo metropolitan area.

### Challenges

Given the complexity of the rail system, a lot of preparation was needed to realize these planned new services in a short period of time. An integral component to this preparation was implementing a robust IT infrastructure, but the networks that carry the communications posed major challenges.

A railway station is equipped with a high number of networks. For example, Tokyo Station—one the largest railway stations in the world, boasting 13 train lines and catering to 400,000 passengers each day—is equipped with several dozen types of networks:

- Train service information network
- A network of cameras used to manage the operating status of escalators and various other types of equipment
- Surveillance camera network
- Business system network for all onsite tenant shops

“We originally built each of the networks separately as the need arose,” explains Hajime Yamada, General Manager of Electrical & Signal Network System Department at JR-EAST. “This resulted in extensively jumbled wiring on the backend, creating an extremely complicated situation for us.” Adding to this complexity was the level of workloads and bloated timeframes involved when adding and/or modifying a network.

A railway station undergoes frequent improvement work and each time it does, configuration changes have to be made to the respective network devices.

“The situation was such that the wiring was so disorganized and complex that it was almost impossible to get an overall assessment of the system,” says Ichiro Sone, railway ICT solutions project group leader at JR-EAST. “We couldn’t even figure out which cables were connected to which pieces of equipment. The contractors and people in charge of overseeing the work had to repeatedly run back and forth between the meeting room and construction site to verify they were on the right track. To add to the challenge, construction work inside the station could only be conducted when there were no passengers. This meant that the time window for work started three hours after the last train



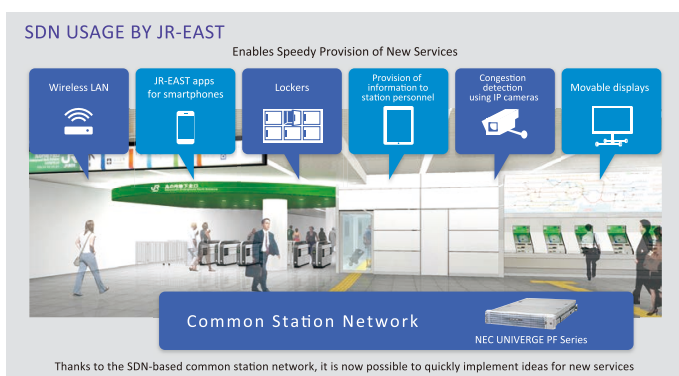
arrived at night until the first train arrived in the morning. Under these circumstances, planning new services is one thing but realizing them is not easy.”

## Solution

In order to solve the complex network problem and provide an infrastructure designed to facilitate the expansion of services in the future, JR-EAST devised a plan for the construction of a common station network (JR-STnet). This plan called for integrating the vast array of networks laid out around the station and centralizing their management. It also aimed to achieve an environment in which networks could be added and modified as quickly as necessary.

To accomplish this, JR-EAST selected NEC’s Software-Defined Networking (SDN) Solution. The NEC SDN Solution, which virtualizes a network using software control, makes it possible to quickly put together a smart, independent virtual network called a Virtual Tenant Network (VTN). “Network additions and updates can be handled flexibly without having to revise the physical configuration or individually reconfigure each individual machine,” says Mr. Sone. “For folks like us, who have had to struggle with the networks each time an improvement was made or a system added, this is the optimum technology.” This is the world’s first implementation of SDN in the railway industry. (Source: NEC)

For a company like JR-EAST, which has the responsibility of maintaining a social infrastructure, reliability is of utmost importance. “NEC already had experience providing SDN solutions to major corporations and large organizations like university hospitals, so we knew they had the proficiency and expertise based on their numerous achievements in this field,” said Mr. Yamada. “We also took into consideration the inherent technological prowess for which NEC has long been acclaimed. Selecting NEC gave us peace of mind.”



## Results

The common station network has already been deployed and is in operation. JR-EAST plans to push forward with integrating the

various systems inside the station, and is now constructing a “wireless LAN” backbone VTN linked to the major carriers and a VTN for determining locker availability inside Tokyo Station, and is operating these on the common station network.

“The time and trouble spent when adding a network in the past, and/or relocating equipment and changing configurations due to construction projects inside the station have been eliminated,” says Mitsuhiro Yasumoto, railway ICT solutions project group member at JR-EAST.

“The common station network not only makes it possible to greatly reduce construction times and processes, but also enables the rapid deployment of new services, and is expected to serve as the driving force behind strategic IT activities.”

“When the network goes down, a lot of problems occur, such as the provision of train service information coming to a halt,” says Mr. Sone. “The station network must be kept operational. Thus, the common station network, in addition to providing equipment redundancy, ensures alternative routes in two directions at a minimum, and achieves high availability. In addition, even in the unlikely event that trouble should occur, the cause of the problem can immediately be discerned using an easy-to-understand graphical user interface. Our perfect environment has been realized.”

JR-EAST plans to make good use of the common station network to provide a variety of services in the future, too.

“As a public transportation company, we feel a strong obligation to strive to enhance the quality of our services,” emphasizes Mr. Yamada. “Not only for our Japanese patrons, but for the foreign visitors who ride our trains as well.”

One such plan is aimed at utilizing a wireless LAN and tablet PCs to expand and improve operational support services for station personnel. If train delays and other such scheduling information could be transmitted from the control room directly to tablet PCs being carried by station personnel, this would not only be useful for the station personnel in carrying out their jobs but would also enable the provision of more detailed information and guidance to passengers.

The company is also exploring a variety of new service possibilities, such as to detect and display passenger congestion in the concourse and train platforms by using IP cameras, and to display train service information at the required location.

By leveraging the SDN Solution, JR-EAST has successfully improved the quality of service at Tokyo Station. On the basis of this success, the company intends to actively create common station networks at other major train stations where similar circumstances exist.

NEC will continue to contribute toward the realization of a better society through railway services, as well as the construction of a variety of social infrastructure systems. To achieve this, the company is prepared to further accelerate the strengthening of its IT solutions, commencing with the SDN Solution.