

Case Examples of Improvements to Customer Service at Unmanned Stations of Nagoya Railroad through Implementation of IP Intercom and Video Surveillance Coordinated Systems

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The effects of a declining birth rate and aging population as well as a decline in transport personnel have impacted the railway business in recent years. Under such circumstances, enhancement of the earning capacity has become an urgent business for Nagoya Railroad Co., Ltd. (hereinafter referred to as "Meitetsu") as they engage in activities for strengthening the organization of the entire corporate group in preparation for the future. Reducing costs through improved efficiency and changing the work style of business operations, in particular, are critical issues. A solution for such issues is the unmanneding of stations, reducing labor, while implementing automatic ticket gate systems.

The conversion of station duties into unmanned stations and the reduction of labor or the implementation of automatic ticket gates, however, meant that services readily available with manned stations would no longer be offered and this could lead to deterioration in the level of service offered to customers.

This paper describes the "IP Intercom and Video Surveillance Coordinated System" that succeeded in satisfying the proposals for improving business operational efficiency and service level, while reducing costs.

Background of system studies

Railways and bus lines in the Chukyo District are promoting the implementation of "TranPass", a common prepaid card system. Meitetsu is retailing the card with the name "SF TranPass Card".

Meitetsu installed automatic ticket gates at stations using the "TranPass" system. Unmanned stations have been equipped with intercoms, which serve as service windows to assist customers in ensuring that automatic ticket gates present no problem for customers and surveillance camera systems simultaneously installed to keep track of the status of customers.

With the threat of terrorist attacks, such as the underground terrorist attacks in the United Kingdom, a concern for railways around the world, it has become necessary to consider enhancing the disaster management organization. The intercom system and video surveillance system are, therefore, playing an ever-increasing role as systems for emergency communications in the event of an accident or incident at a station.

Meitetsu started implementing analog intercoms and analog cameras from 2001 in order to respond to such situations. Duties relating to intercom responses and surveillance for five to ten unmanned stations began at

centers located in base stations for each railroad line segment.

However, there have been some issues and requests relating to analog intercoms (see below).

Consideration of this system began with the aim to resolve such issues.

■ Issues and requests¹⁾

① Deterioration in communication sound quality

Conventional metal cables dedicated to intercom use were laid alongside the rails, making them susceptible to the effects of noise with the sound quality deteriorating as the distance from the terminal to the center became wider. This made it difficult to pick up the voice of a caller whenever contact was made via an intercom. It is hoped that this deterioration in sound can be prevented through the digitization of the communications.

② Constraints of distance between unmanned stations and centers (Figure 1)

Constraints exist on the locations for establishing centers, as the distance for communications via analog intercoms is limited to 20km. In order to determine which district would be the most efficient location for establishing a center in the future, it would be necessary to eliminate such constraints.

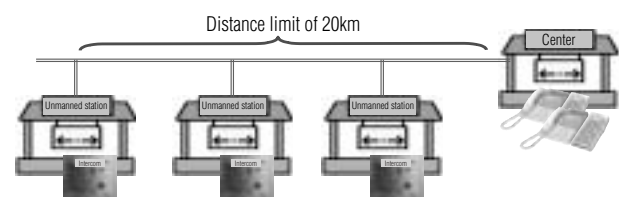


Fig. 1 Constraint by distance

③ Responding to multiple calls in same line district (Figure 2)

Because a single call occupies the entire communication line it is not possible to have multiple calls on a single line with analog intercoms. For this reason customers sometimes have to wait when multiple calls are made from the same line district. It is hoped that the level of service can be improved and all simultaneous calls can be responded to so that customers would not be made to wait, as long as there are personnel to respond through n:m dialogs with customers.

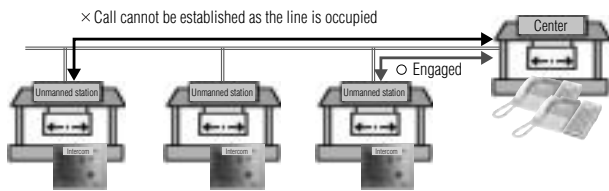


Fig. 2 Multiple calls on identical lines

④ Line laying costs

Since metallic cables dedicated to the intercoms must be laid, some costs will be involved. It is hoped that the line laying costs will be reduced through the utilization of the existing IP network (optical fiber network) used to accommodate the TranPass system.

⑤ Video surveillance coordination during n:m calls (Figure 3)

Even if n:m calls were established, the contact control method of conventional intercoms would not be able to trace the displays from video surveillance and it would not be possible to link the voice with the video image. It would be desirable, considering the load of duties on center personnel, to automatically provide video images of the location from where a call is made, regardless of the location.

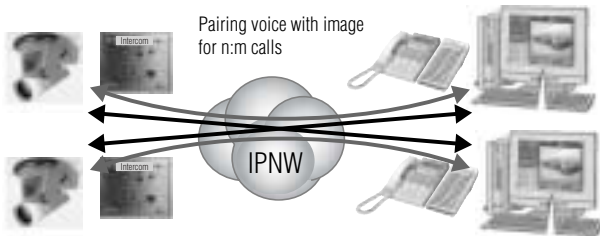


Fig. 3 Video surveillance coordination during n:m calls

⑥ Video surveillance coordination with various facilities

Other than calls the remote operation of various facilities, such as the opening and closing of station shutters, is being performed while the onsite status is visually verified. Video surveillance of these facilities have been provided via sequencers in the past, but it is hoped that video surveillance will be possible from terminals located at any center with the n:m call connections.

⑦ Expandability of surveillance camera systems

It is hoped that consideration can be given for coordinated systems to increase the number of installation locations of cameras in a flexible manner, while consideration is given for the future of the video surveillance system to ensure that there will be no constraints arising from the current system's limitations.

Concept for system considerations

The building of an environment in which the required items (voice, image and information) are provided to the necessary locations (stations, centers, headquarters, etc.) via an IP network in a flexible manner based on the concept of AP@PLAT^{®1)} in response to the issues and requests of customers.

Furthermore, the integration of all applications on a server has been considered to minimize the necessary work and costs arising from changes, when locations or terminals are added to the system.

Outline of system

The roles of the system are divided into two major categories for managing voice calls and coordinating voice with video surveillance images.

(1) System for managing voice calls

Implementation of the system was considered using an IP-PBX (DISCOVERY^{®1)} 01) as the server and by developing IP intercom terminals dedicated to the system. An overall configuration of the system is shown in Figure 4. The features of the system naturally include solutions for the issues mentioned under the aforementioned sections ① to ④ and realization of the requests, however, aside from those it is also possible to accommodate the following operations:

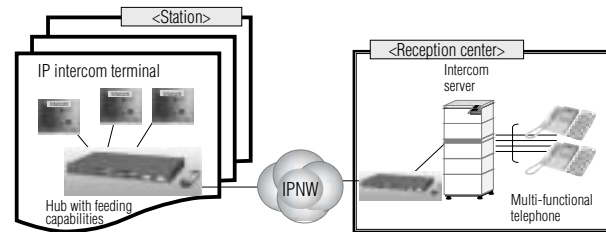


Fig. 4 Voice system

• Inquiry transfer operations

It is now possible to transfer inquiries that require a call transfer via IP-PBX. This enables the center itself to handle calls for which it is unable to respond by transferring them to appropriate corporate organizations, thereby providing a rapid respond to customers.

• Center allocations and personnel distribution operations

Centers can now be changed to accept calls during the day, night or on holidays by using the hotline feature of a PBX. This facilitates the allocation of centers and distributes personnel in a flexible manner.

• Maintenance operations

By using maintenance tools provided by the PBX it is now possible to determine whether intercom terminals are suffering from malfunctions on the communication

*1) AP@PLAT and DISCOVERY are registered trademarks of Oki Electric Industry Co., Ltd.

board level from the centers. This improves the maintainability of the system.

(2) Voice and video surveillance system coordination

Surveillance cameras and video image storage systems utilize existing systems while a server system was incorporated to pair up surveillance cameras and IP intercoms and video surveillance terminals and phones at centers, as well as the switching of video images (Figure 5).

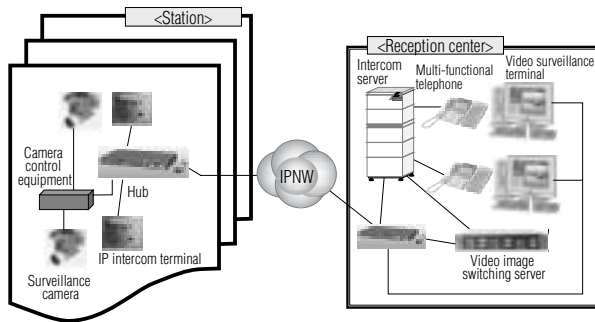


Fig. 5 Surveillance image coordinated system

Conventional pairing of images with voice was possible since the telephone that received voice calls, as well as the display terminal that showed video images, were fixed to a particular location. Responses were possible simply by raising the contact information to the camera control equipment from the intercom terminal. With the implementation of the IP intercom system, however, an environment for conducting n:m communications has become available, making it necessary to track video images accordingly, thereby raising the necessity for video image switching for n:m communications.

To handle the issue a direct screen switching function, through camera controls and UTP (hereinafter referred to as "video image switching") with an extension line call information output from DISCOVERY 01 and HTML documents on the "if Server DL380 G4", was developed jointly with Meielec Co., Ltd., which is a Meitetsu Group company and the provider of the SI service for the project.

The camera attribute information paired up with the IP intercom terminal and the IP address of the video surveillance terminal, paired up with the telephone at a center, are registered on the "if Server DL380 G4" beforehand. When a call between the IP intercom terminal and the telephone at the center commences the DISCOVERY 01 system feeds the call processing information to the "if Server DL380 G4". The "if Server DL380 G4" system notifies the video surveillance terminal and indicates from which camera it should acquire video images by translating the call processing information and paired camera attribute information with the IP address of the video surveillance terminal.

The issues mentioned in the aforementioned sections ⑤ to ⑦ are resolved by performing all such coordinated processes on a single server and a video image of the location is automatically displayed on the video

surveillance terminal next to the telephone that initiates the call. The manning of personnel for such a telephone is not required for any operation in response to customers, with coordinated voice and images.

Furthermore, since the transfer processing of video images can be performed along with the transfer process of voice calls, the transfer of operational duties to appropriate personnel in charge is achievable according to the content of the inquiries.

Progress of implementation

Meitetsu started their service in the following implementation sequence after due consideration and development of the system:

- March 2005: Tokoname Line, Airport Line, Ichinomiya Sector of Nagoya Main Line.
- July 2005: Tsushima Line.
- August 2005: Chiryuu Sector of Mikawa Line.
- October 2005: Jingumae Sector of Nagoya Main Line and Higashi-Okazaki Sector of Nagoya Main Line.
- December 2005: Kou Sector of Nagoya Main Line, Toyokawa Line, Gifu Sector of Nagoya Main Line, Toyota City Sector of Mikawa Line and Toyota Line.
- February 2006: Komaki Line (planned as of January 2006).
- March 2006: Inuyama Line (planned as of January 2006).

Voice of Customers

① System considerations

We received the following comment from Mr. Yuhei Kato, Manager of the Communication Design Section of the Design Department at Meielec Co., Ltd., describing the reason for selecting a mixed environment with IP rather than expanding the analog system at Meitetsu²⁾:

"There is no doubt that various types of communication structures will be converting to IP in the medium to long range future. By using IP, it is possible to fuse the system with information systems even if we consider system expansions that include collaboration with various applications. Since we would like to make effective use of the existing analog structure, however, we decided to take a structure of coexistence." Also, with regards to the reason for selecting DISCOVERY 01, he also indicated:

"We evaluated the system based on switching equipment that has past performance records, which is reassuring for us."

Furthermore, with regards to the cost benefits we received the following comment from Mr. Yoshikazu Kanda, Assistant Manager of Electrical Section in Rolling Stock Electrical Department of Railroad Business Division at Meitetsu:

"There were cost benefits for the implementation since no investment was necessary for the conversion to metal lines required for analog intercoms. We believe we made substantial savings in comparison with expanding using analog systems."

② Expectations from Oki Electric

The following comments were received from the aforementioned Mr. Yoshikazu Kanda about the expectations of Oki Electric from our customers considering the system:

“In some areas it is difficult to conduct IP conversions for railways. In this aspect we are comforted by the knowledge that Oki Electric has a long history in the field of communications with regards to both analog and IP and we trusted them to be able to also fuse and integrate the information technology with the communication technology. These became the key points for selecting Oki Electric.”

“The possibilities of IP for integrating images with sound and data are expanding greatly, as well as responding to mobile applications. We would like to formulate proposals to reap such benefits for our corporate internal use. We hope that Oki Electric will be able to provide us with timely information and ideas for such purposes as well.”



Photo 1 Scene depicting utilization on site: Camera and IP intercom inside the station.



Photo 2 Scene depicting utilization on site: Surveillance Center.

used remote manipulation of station equipment with information retrieval systems to provide proposals for system expansions in the future, including collaboration with existing systems.

We hope that such activities will contribute to further raise the efficiency of operations and improve the service levels at Meitetsu.

References

- 1) Narita, Tachibana and Midorikawa: “Application of information and communication fusion for unmanning and labor reduction concepts in railway business”, Oki Technical Review Issue 201, Vol. 72, No. 1, pp. 44 to 45, 2005.
- 2) “Implementing IP Intercom System to Realize Service Level Improvements and Cost Reductions”, Nikkei Communication, No. 10.15, pp. 14 to 17, 2005.

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Conclusion

We introduced an example of implementation as a communication system that utilizes voice and video images as part of an inquiry operation, which is a point of contact between customers and the railway company, as well as disaster management operations.

We intend to further fuse IT with IP in the future, while collaborating between operations, such as the currently