

Taking a Closer Look at the 20-year History and Future of JR Systems

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JR Systems, a member of the JR group of companies, plays a major role in managing data networks and information-processing terminals, especially the key MARS passenger reservations and ticketing system. This article explains how the company keeps these systems running efficiently and stably while meeting changing customer needs.

20 Years in Business

More than 20 years have passed since Railway Information Systems Co., Ltd. (JR Systems) was established on 9 December 1986 just prior to the privatization and division of Japanese National Railways (JNR) into today's six JR passenger companies and JR Freight. These seven companies now hold all the shares in JR Systems, which started business on 1 April 1987. JR Systems took over some of the old JNR nationwide information systems, including ticketing and reservations, and freight and data

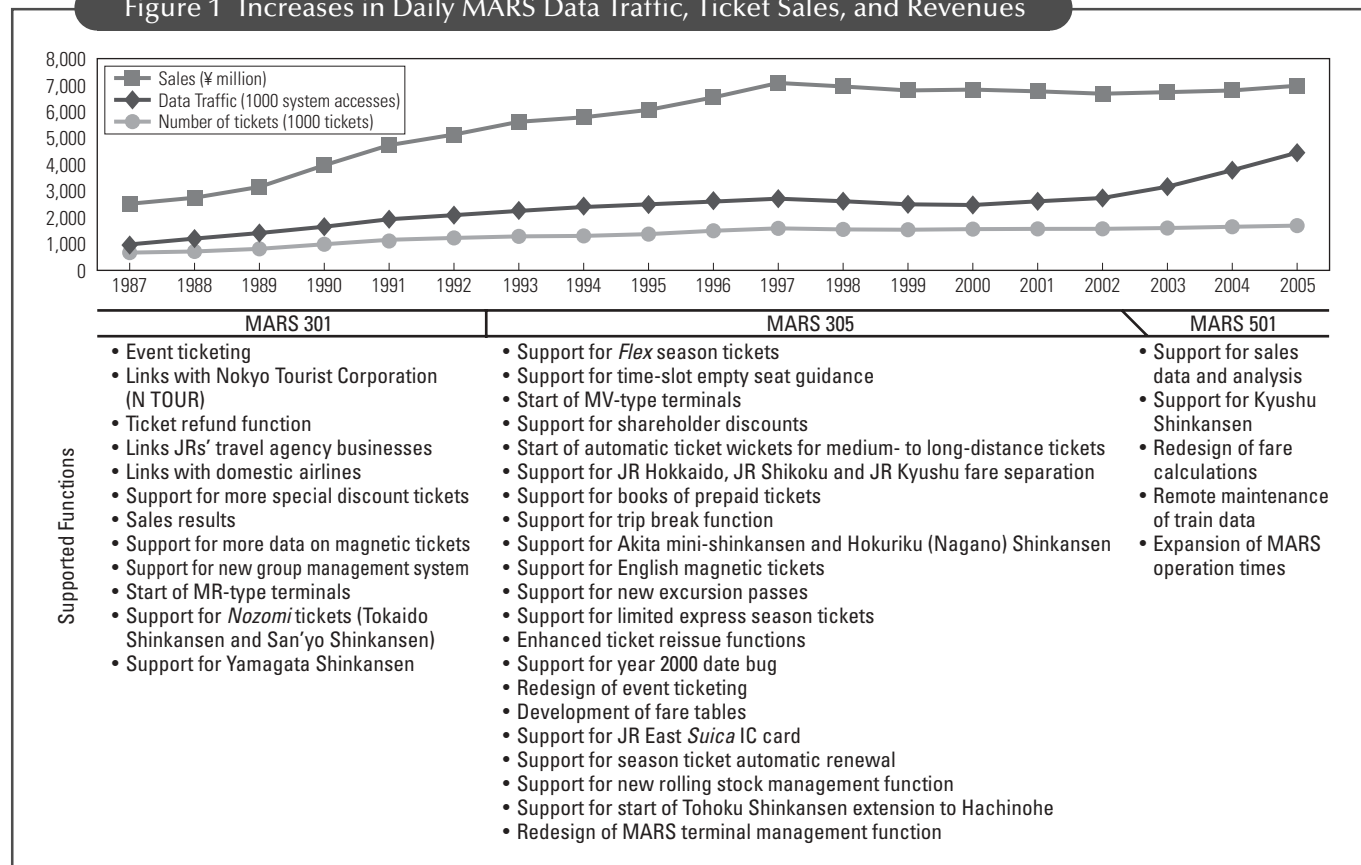
management, plus the new revenue settlement system necessitated by the formation of the new JR's. This article reviews the progress JR Systems has made in its 20-year history and looks toward future plans.

History by Operational Sector

Main information operations

The main information operations include development and operation of systems acquired from JNR, ranging from

Figure 1 Increases in Daily MARS Data Traffic, Ticket Sales, and Revenues



the Magnetic electronic Automatic Reservation System (MARS) for ticketing and reservations to the data exchange (DXS) and revenue settlement systems. JR Systems puts these systems at the top of its responsibilities because they are critical to the JRs' daily operations.

MARS

MARS is a general multifunction reservation and ticketing sales system developed by the Railway Technical Research Institute (RTRI) in 1960 for JNR and had reached the fifth-generation MARS 301 by the 1987 JNR division and privatization when it was made up of five mainframe computers.

JR Systems increased the range of MARS products with online ticketing for the JRs' travel agency businesses, domestic Japanese airlines, and events such as concerts, theatre performances, etc., generating steadily rising revenues (Fig. 1). In 1989, MARS 301 was updated to handle the change in the Japanese calendar system from *Showa* to *Heisei* based on the reigning Emperor, and the introduction of the 3% consumption tax.

The sixth-generation MARS 305 came online in 1993 when the aging hardware was updated. It was a software-based design offering increased flexibility for ticket sales and marketing. The system was consolidated into two super mainframe computers for better cost-performance and higher efficiency. Functions were enhanced to support passenger ticket sales and marketing for each of the JRs, including the new shinkansen services. Although subsequent improvements increased the volume of data that could be handled, it was still overloaded when too many people tried to buy platform tickets at 11:11 on 11 November in Heisei 11 (1999) so that the ticket date and time would be all 1s. Despite this unfortunate event, the system survived the date transition to 2000 without the so-called year 2000 bug causing any problems due to preventive countermeasures and function checks.

MARS 501 was developed between FY2001 and FY2003



The cross-platform transfer between the Kyushu Shinkansen and the conventional Line at Shinyatsushiro Station won the Japan Railway Award. (Transportation News)

in response to the change in its role from large data volumes and high processing speeds toward diversification and customization resulting from the range of different tickets sold by the JRs. Hardware costs were cut by using desktop computers and small, distributed servers. Software was also redesigned to configure a virtual MARS for each JR company running within one physical MARS system and offering each JR company customized sales and marketing data while ensuring compatibility with every other company's sales and marketing data. As an example, JR Systems developed a function allowing passengers on the Kyushu Shinkansen to make cross-platform transfers to conventional lines using a single ticket. JR Systems and JR Kyushu shared the coveted 2004 Japan Railway Award for this innovation.

As a result of such initiatives, the share of MARS passenger revenue rose from 27% in the JNR era to 64% in FY2004. Excluding ticket machines for short journeys, nearly all ticketing equipment now used by the JRs is incorporated into the MARS network. For the future, we plan to enhance the quality of MARS to assure stable operation.

DXS

The DXS has been used since the JNR era to collect and distribute a large amount of data on weather and passenger numbers on a nationwide scale. Following the JRs' establishment, the DXS has evolved to meet new needs caused by changes in the business environment. For example, the increased use of PCs has enabled users to collect their own data and there is a reduced need to share information between the different JRs. Operating costs have been cut by replacing the central multipurpose computer by small servers; the Data Processing (DP) terminals used by conductors have been running Windows since 1996, and rich client technology was introduced in FY2004.

Currently, DXS operations send required information to conductors' DP terminals, collect and distribute event-related information (including information on cherry blossoms, autumn leaves, snow cover, etc., for tourists) and distribute MARS data by fax.

Revenue settlement system

The revenue settlement system calculates the share of the fare income due to each JR company when a passenger travels across sections owned by two or more JRs, making accuracy the number one priority. Although the system dates from the JNR era, fares are still calculated based on total journey distance using a tapered tariff. Following the takeover by JR Systems, serious software bugs caused significant inconvenience to the JRs, but enhancements and hardware revisions solved the system's failings. Originally, the JNR settlement date had been the 24th day of the following month, but the JRs listing on the

stock exchange required faster settlements to allow faster announcement accurate business results. As a result of various improvements and revisions to data access methods, notification of revenue settlements is currently made on the 8th day of the following month.

Network operations

To actively generate new business and increase operations' efficiency, each new JR company enhanced its existing online systems and developed new systems, requiring JR Systems to improve network services and access points and enhance reliability.

The first JR Systems network services used the packet-exchange network part of the DXS system acquired from JNR. To reduce communication costs, the network systems and terminals are evolving from packet and frame relay to IP services. Future demand from the JR companies for new network-based services, such as IP signalling or GPS train tracking, require JR Systems to invest in the latest technological advances.

MARS Ticket Terminals

In FY1992, the old ticket-window M terminals dating from the JNR era were replaced by cost-saving MR terminals using personal computers and featured automated data maintenance to handle tasks, such as timetable revisions. To lighten the workload of ticket window staff, a new customer-operated MV terminal for purchasing reserved tickets was launched in FY1994. Additionally, an MD terminal showing seat availability was also developed for use with the MV terminal when purchasing reserved seat tickets. Terminal operations are a central pillar of JR Systems'



Passenger-operated MARS MV-30 terminal developed for passenger convenience and better booking-window efficiency (JR Systems)

business but increasing competition requires staying at the cutting edge of new technologies supporting new sales methods, such as ticketless sales using mobile phones with built-in *Suica* functions now appearing in other markets.

Information processing

Various clients, including the six JR passenger companies, JR Freight and bus companies in the JR group have commissioned JR Systems to develop and operate information systems, covering passenger and train management, etc.

When JR Freight implemented its new freight systems, they used our knowledge and expertise gained from development of JNR freight management systems. In addition to operating a system for notifying forwarding agents about container shipments, we also provide settlement services for shippers and delivery agents.

The JR bus companies have asked us to develop a new centralized sales system to sell a wide variety of appealing travel products at sales channels other than railway stations. Other businesses include support for distributed electronic data exchange (EDI) and development of EDI software products.

New operations

To diversify from our heavy dependence on customers in the JR group of companies, JR Systems is challenging new business fields, especially in the explosively popular mobile phone market. A major long-term success has been development of a call-charging system for J-Phone (now SoftBank).

Company Management and Philosophy

We operate systems that support social infrastructure so they are as important as water or air and we have the considerable responsibility of ensuring they always work properly. Although JR Systems was a very small company immediately after its 1986 establishment, it was entrusted with considerable responsibility by the JRs. Our *Toward 2000* medium-term management vision formulated in 1994 outlines our corporate philosophy (Table 1), emphasizing the importance of staff as the greatest asset of an information systems business. Significant resources are devoted to hiring and training good employees, including introductory training for new recruits, various technical and overseas training and short overseas study programmes.

The company moved its head office from Marunouchi near Tokyo Station to the new JR East Head Office near Shinjuku Station in 1997. Expanding operations and the lessons of the 1995 Kobe Earthquake resulted in a second earthquake-proof Central Information Systems Center in Kokubunji, in the Tokyo suburbs.

Table 1 Corporate Philosophy

[Caring for people]

Valuing its shareholders and its clients, JR SYSTEMS prospers with the trust of both parties. Inside the company, our staff reach fulfillment in an environment of respect, trust and cooperation.

[Creating an affluent society]

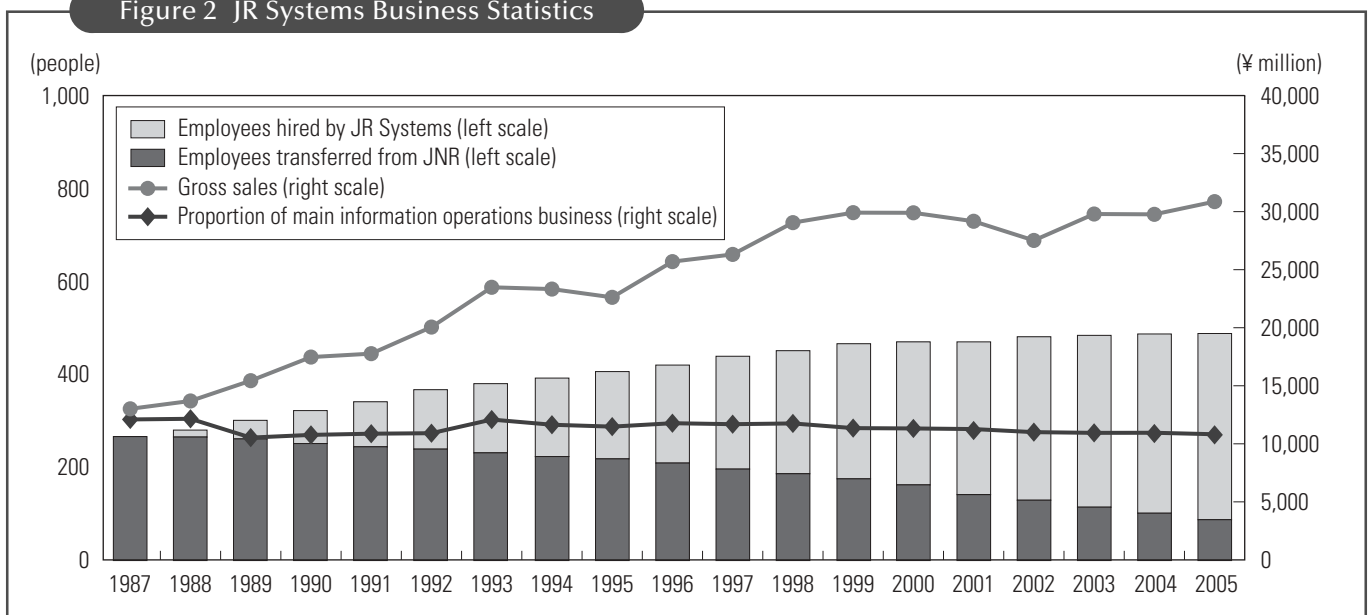
By developing and managing data communications systems for JR Group, transport, logistics and tourism, JR SYSTEMS supports a network for an affluent and comfortable society.

[Providing reliable, optimal services]

Based on its extensive advanced technology and experience, JR SYSTEMS offers the latest information technology with reliable, optimal services.

(<http://www.jrs.co.jp/somu/english/index.html>)

Figure 2 JR Systems Business Statistics



Passing-on Best of JNR Technology

Most of our employees (80%) come from the IT business sector and have no concrete experience of railway operations. Additionally, many of the remaining 20% transferred from JNR will be retiring in 2007 (Fig. 2). Passing-on the best of JNR technology to new employees with no direct experience of passenger railway transport is a major issue to solve. One solution being discussed is secondment of our young IT engineers to the JRs so they can learn about passenger operations and sales.

Future Outlook

Against a background of sluggish growth in transport services due to Japan's aging population, and severe competition in the information systems industry, we see our role as providing stable and efficient information systems that support future passenger needs by making full use of our employees' skills, advances in technology, and a strong sense of mission.



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