The most important aspect is the usability of the Invensys solution. It enables us to easily implement new demands and features for the system, so system extensibility is excellent.

Shao Xiaofeng, Vice President, Easyway Company Limited

The Longest High-speed Rail Line in the World Operates on ArchestrA System Platform

Goals
- The nationwide high-speed railway network required quick implementation, effective integration with third-party components and a user-friendly operator interface
- A problem-free growth path was imperative for the planned expansion of the 12,000-kilometer rail network with more than 800 stations

Challenges
- After completion of the 120-kilometer Beijing-to-Tianjin line for the 2008 Olympic Games, Easyway was tasked with expanding the solution throughout China by 2020
- The company had to quickly duplicate systems, processes and functions implemented at major passenger stations for smaller stations throughout the rail network

Solutions and Products
- ArchestrA® System Platform
- InFusion™ Enterprise Control System
- Wonderware® InTouch® HMI
- Wonderware Historian
- Device Integration Servers
- Wonderware Toolkits

Results
- The ArchestrA System Platform and Wonderware InTouch HMI solution allowed the integration of 60 different third-party vendors into the station’s Passenger Information System.
- New stations can be deployed as needed and configured in as little as one day
- Operational costs have been lowered because personnel can be reduced or allocated more effectively
- Better visibility to the entire system has led to decreased maintenance costs
Beijing, China - Since ancient times, China has been recognized as a cultural and industrial leader, contributing to the world a rich panoply of art, literature and scientific achievements. China boasts a recorded history of thousands of years of technology innovations, so it's no surprise that the population of more than 1.3 billion people is on the move once again. The economic powerhouse has embarked on an ambitious course to provide high-speed rail service throughout the entire country.

Large-scale projects are nothing new to China. Built between the fifth century B.C. and the 16th century A.D., the Great Wall covers more than 8,800 kilometers (5,500 miles) and is the longest man-made structure in the world. The new high-speed rail lines, developed by the China Ministry of Railways, have to be completed in a much shorter time frame. The first 120-kilometer (100-mile) leg of the high-speed line was inaugurated during the 2008 Beijing Olympic Games, with service between Beijing and Tianjin. The 30-minute high-speed trip saves travelers 40 minutes each way, with trains zooming along at speeds of up to 350 kilometers per hour (220 miles per hour). To complete the initial high-speed rail project in time for the Olympic Games, the Ministry of Railways selected solutions from Invensys Operations Management. Invensys distinguished itself by offering the unique advantage of off-the-shelf, object-oriented software, which contrasted with previous passenger service systems in China that had been based on proprietary solutions that were expensive, hard to configure and difficult to maintain.

Facilitated by the implementation of 21st century technology, the world’s longest high-speed rail network operates on Archestra System Platform, which is part of the InFusion Enterprise Control System from Invensys. When the China railway system is fully completed in 2020, it will carry both passengers and goods and will be able to reach distances of 4,000 kilometers (2,500 miles) in less than a day.

The complex rail network involves the collaboration of more than 60 different third-party vendors for each station’s facilities management system. To manage station technology infrastructure, the China Ministry of Railways engaged the services of Easyway Company Limited, an Invensys Ecosystem Partner that specializes in railway solutions. Every vendor can communicate seamlessly with each other because of the Archestra System Platform, which allows Easyway to quickly and easily respond to railway ministry requirements. System Platform provides a single, scalable platform for all SCADA, supervisory HMI and MES required by railway operators to manage overall facility operations. System Platform also provides a simple upgrade path to easily add new software and hardware to the system.

“We had three or four choices before selecting Invensys,” said Shao Xiaofeng, vice president at Easyway. “We eventually selected Archestra System Platform due to two main reasons: first, we believed it had the capability to rapidly meet the requirements of our client, and we thought it could meet the time requirement after evaluation; second, we thought the stability of this system was unique. Experience proves that our choice was correct. From the initial operation in 2008 until today, no problem due to the System Platform has caused any system failure.”
Large Project Scope, Short Time Frame

The China Ministry of Railways is responsible for passenger services, regulation of the country’s rail industry, development of the rail network and the overall rail infrastructure. In a country that encompasses more than 9.6 million square kilometers (3.7 million square miles), this is no small task. China needed a passenger station management system that could be implemented quickly and expanded efficiently as well as one that would easily integrate with China’s existing rail technology infrastructure. The railway ministry also wanted a user-friendly interface that would make operating and managing the railway network as economical as possible.

“The most important features of the Invensys system are usability and expandability,” said Xiaofeng. “We can easily plug in the new features and expand them to new stations in a very short time.”

Grand Central Issue: Managing Station Facilities

The first stage of the project – the high-speed Beijing-to-Tianjin line – included five stations. A primary goal was to ensure that the facilities management system (FMS) would make these stations hospitable and safe for travelers. Called the Passenger Information System, the FMS provides an integrated and centrally managed platform to support communications equipment, including the public address system, video displays and automated ticket sales, plus closed-circuit television monitors and other components used by supervisors to manage operations and safety systems.

Whistle Stop for Scalability

The Chinese government railway agency knew that selecting a partner that could provide technology to benefit the project over the long haul was critical. With solutions from Invensys, the railway ministry could scale the enterprise, beginning with the Olympic line and extending it in stages to the entire nationwide high-speed rail network as needed.

The InFusion Enterprise Control System synchronizes the multi-faceted Passenger Information System of the China Ministry of Railways high-speed rail lines. Thanks to the scalability of InFusion, the Ministry of Railways continues to quickly and easily expand the size and scope of the high-speed line. The InFusion system embraces all aspects of operational excellence, solving complex business challenges that include scalability, connectivity, synchronization and accelerated value. Today, more than 220 railway stations across 15 high-speed rail lines are controlled by Invensys. Once complete, more than 800 new stations will be running on Invensys technology solutions throughout the 12,000-kilometer (7,500-mile) rail network.
“The scalability of the software makes it possible to execute the project in stages,” said Mark Davidson, vice president of global marketing programs at Invensys Operations Management. “This allows railway managers to budget resources properly.”

Scalability is among the highest priorities of the Passenger Information System. Railway facility technology solutions typically start with modest goals as proof of concepts are validated. Then they expand rapidly using lessons learned and the tools created during initial project phases. The Invensys software-based system is open, enabling engineers to develop applications and then easily reproduce them internally, without the assistance of outside experts. Standardized objects promote repeatability and customization and save time, so that new stations can be deployed to meet strict budgets and deadlines. In fact, stations have been configured in as little as one day. And when changes are needed, they can be made at select stations, or even rolled out across the entire system, thanks to the Invensys application templates.

The Power of Technology
Operating in Harmony

Before the China Ministry of Railways developed the plan that began with the Beijing-to-Tianjin line, its Passenger Information System was not integrated. Components were purchased from different manufacturers and did not operate well together. Stations and terminals were not linked efficiently, creating inefficiencies in deployment, operations and maintenance.

Today, the system benefits from a unified management strategy, standardized technical architecture requirements and centralized operations. For example, because the Passenger Information System is built on the ArchestrA System Platform, data connectivity is maximized, allowing railway facility operations to be unified and controlled from the central system. Plus, through the Wonderware Toolkit, third-party solutions used in conjunction with the FMS also communicate with the central application. This creates a fully integrated approach that enables all status and control instructions to be shared automatically with every rail station in the entire network. Currently, the ArchestrA System Platform installation for the Passenger Information System manages approximately 200,000 I/O points. By the time the project is completed in 2020, the Invensys solution will manage more than 3 million I/O points.

“During the Olympic Games, we were pressed for time so we developed the integrated system for the stations within nine months, which benefited from the use of ArchestrA System Platform,” said Xiaofeng. “Then the Ministry of Railways required us, within a very short time, to use this system to reproduce the functions of big stations at the smaller stations. The government wanted to reduce labor costs and decrease personnel. After doing relatively little development and commissioning work, our Invensys-based system easily extended to the smaller stations.”
The ArchestrA System Platform has given Easyway the ability to create all the modules needed to deploy the Passenger Information System. More important, collective knowledge relating to routines, communications, control, security, redundancy and historization have been encapsulated in System Platform. This information can now be deployed in subsequent projects and creates standardization and uniformity for solution deployment at all railway stations throughout China. The implementation of engineering applications has been enhanced by this process, enabling operators to rely on common user interfaces and procedures regardless of which railway station or control room they may be assigned.

Operators monitor and control station assets and communications equipment through this core system, enabling them to manage the comprehensive capabilities of the FMS. Managers can assign and move personnel according to demand, a functionality which has resulted in reduced operations costs. And since some of the station equipment operates automatically, the Passenger Information System is saving energy as well.

Planning has also improved. The Wonderware Historian provides real-time station asset data for trending and analysis as well as more efficient and complete reporting. The Wonderware solution interfaces with third-party databases and Microsoft Office programs such as Excel and Word, allowing information to be shared readily.

“With the implementation of the ArchestrA System Platform, China’s Ministry of Railways is laying a solid technology foundation for the future growth of the unified station management system,” said Steve Garbrecht, vice president of product, services and solutions marketing, Invensys Operations Management.

The End of the Line Offers Greater System Visibility

The new Passenger Information System controls all station displays, the public address system, schedules, customer assistance, baggage storage and more. That makes the human machine interface (HMI) provided by Wonderware InTouch crucial. Operators depend on it for overall visualization - whether they are working at a remote station or a central monitoring location. Railway operators use the HMI to view the status of each device, plus they receive and manage alarm information and easily apply corrections when needed.
Another important aspect of operating a large rail system is maintenance. The Invensys solution enables the railway ministry not only to respond promptly to needs for repairs, but also to develop a systematic program to maintain the railway system for optimum performance and upgrades.

The Right Track to Success

The China Ministry of Railway’s journey to provide extensive rail transportation services is on the fast track to success. In less than 10 years, it is estimated that the Invensys solution developed by Easyway will help the railway agency connect 1.3 billion people in comfort and at great speed. So far, new passenger stations have joined the network on schedule. Considering China’s storied history, not bad for the construction of the longest high-speed rail line in the world.
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