



CASE STUDY

MARKET: RAILWAYS

REGION: CHINA

COMPANY: XI'AN METRO CO. LTD

XI'AN METRO OFFERS SEAMLESS CONNECTIVITY ON METRO LINE 2 IN CITY OF TERRACOTTA ARMY

Alcatel-Lucent delivers an end-to-end mobile network and provides a seamless communications experience for 200,000 passengers daily



Xi'an Metro Co. Ltd is a government-owned company responsible for urban mass transit system construction and operation in Xi'an, China. To support Xi'an's growing economy and population, the city plans to construct six metro lines by 2018, with a total length of 200 km. The first line to be built was Metro Line 2. Construction began in September of 2006 and Line 2 began operating on September 16, 2011. It spans 20 km with 17 stations and is used by 200,000 people daily.

CHALLENGES

- Deliver wireless coverage over 20 km and for 17 stations
- Ensure secure daily railway operations
- Support all local mobile operators
- Avoid interference between the telecom network and the metro signaling system

SOLUTIONS

- Wireless coverage based on a wideband solution supporting 600 MHz~2.4 GHz frequency and providing wireless support for GSM, CDMA, WCDMA, TD-SCDMA and DCS
- Transmission network, including two Alcatel-Lucent optical multiservice nodes: Alcatel-Lucent 1662 SMC and Alcatel-Lucent 1660 SM Optical Multi-Service Node (OMSN)
- Uninterruptible Power Supply (UPS) to purify power from the urban grid and distribute it to the equipment
- Centralized alarm monitoring and management system for security

BENEFITS

- Stable and flexible network to transmit metro operational and management information promptly
- Reliable and seamless communications experience for 73 million passengers each year
- Metro staff can focus on core business instead of technical details
- Compatibility with industry standards and technical requirements of all parties – local mobile service providers and Xi'an Metro



THE CHALLENGES

As Xi'an Metro began planning for Metro Line 2, the first line of a new metro system in Xi'an, China, they looked for a solution to provide public mobile coverage in stations, tunnels and on the trains. The new network should ensure a seamless communications experience for passengers. It also needed to meet the design requirements and support the services of all three local mobile operators – China Telecom, China Unicom and China Mobile.

Security was a major concern. The communications solution should provide safe transmission of voice and data services.

WHY ALCATEL-LUCENT?

Xi'an Metro looked for a vendor who had a complete product portfolio and extensive experience with integration and turnkey projects. Alcatel-Lucent fulfilled these requirements and offered a wideband solution to meet industry standards and the technical requirements of all local mobile operators. The solution had to ensure mission-critical operations as well as a seamless communications experience for metro passengers.

THE SOLUTION

As the turnkey integrator of the network for Xi'an Metro Line 2, Alcatel-Lucent delivered its Intelligent Rail solution including the following services: design, production, testing and onsite deployment in 17 stations, train depot and one central equipment room.

During the design phase, the project manager and team members did onsite inspection in tunnels to understand the environment and design requirements for the communications network.

Alcatel-Lucent also volunteered to coordinate with the local mobile operators to understand their requirements for wireless coverage:

- **China Telecom:** Code Division Multiple Access (CDMA)
- **China Unicom:** Wideband CDMA (WCDMA) and Digital Cellular System at 1800 MHz (DCS-1800)
- **China Mobile:** DCS-1800, Time Division-Synchronous CDMA (TD-SCDMA) and Global System for Mobile Communications (GSM)

The resulting multiservice mobile coverage enabled the operators to expand their networks to the metro line.

The wireless coverage is based on a wideband solution supporting frequency 600 MHz~2.4 GHz. It is composed of point of interface (POI), tunnel and station coverage, with a centralized equipment room in each of the 17 metro stations to house the equipment of the mobile operators.

The transmission network is based on two optical multiservice nodes: 21 points and 1 central point: the Alcatel-Lucent 1662 SMC and the Alcatel-Lucent 1660 SM Optical Multi-Service Node (OMSN). The solution provides a stable and flexible network to transmit metro operational and management information efficiently and promptly. It enables optimized and cost-effective transport of multiple service types.

The power subsystem, based on an AC switching power distribution cabinet, introduces streams of power from the urban grid network to the Uninterruptible Power Supply (UPS). After being purified by UPS, the power is distributed by the output AC unit to the equipment.

"We were impressed with Alcatel-Lucent's ability to deliver an end-to-end solution, from conceptual design to turnkey delivery. Their ability and willingness to take the lead with local mobile operators, to make sure their concerns were addressed, was a bonus we did not expect. We very much appreciate the company's contributions to the Line 2 telecom integration project."

Mr. Jian Chang, Chief Engineer and Project Manager for Communication Systems, Xi'an Metro Line 2

Because the equipment rooms do have safety guards, a centralized alarm monitoring and management system provides security. It initiates alarms for all subsystems for the operation team and includes a database to for alarm records. The alarms include power, temperature and humidity levels as well as communication alarms.

One issue that arose was that the communications system for wireless coverage caused interference to the metro's dedicated signaling system. The project team quickly developed a filter to solve this problem.

Equipment production was followed by integration testing in the factory and onsite testing in all 17 metro stations, the train depot and a central equipment room before deployment.

Network deployment included onsite technical support to ensure the total solution as well as each subsystem was tested and validated by the engineering team to meet the requirements of the metro operator, all three mobile operators and metro passengers.

THE BENEFITS

The construction of Xi'an new metro system and communications network is a complex multi-year project, so beginning

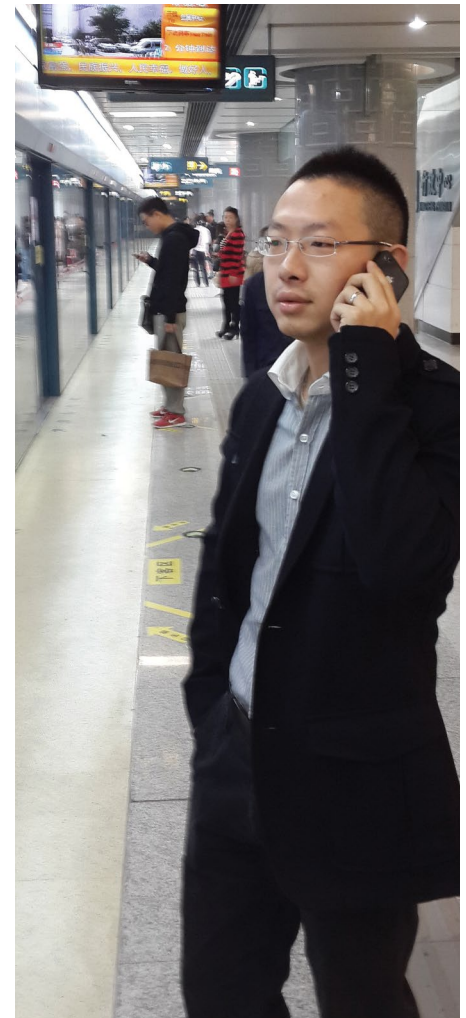
with only one metro line made perfect sense. By the time that the network for Metro Line 2 was operational, Xi'an Metro had the knowledge and processes required to continue with the other five metro lines at a much quicker pace.

With Alcatel-Lucent taking the lead on the Metro Line 2 public mobile communications network, Xi'an Metro could focus on its core business instead of technical details, confident that the solution would meet industry standards and the operational requirements of mission-critical services and all local mobile operators. Metro passengers can enjoy a seamless communications experience – on-time, safe and connected journeys.

SUMMARY

Alcatel-Lucent's end-to-end mobile communications solution and the company's global experience in integration and turnkey projects ensured smooth implementation and stable operation of Metro Line 2, allowing Xi'an Metro to focus in their core business-moving people.

As the telecom subsystem integrator, Alcatel-Lucent strictly followed a central project management methodology and set up a complete team to ensure on-time delivery. During system integration



testing, Alcatel-Lucent took the lead to communicate with local mobile operators and responded quickly to the changes of their requirements.

Urban railway operators can benefit from Alcatel-Lucent know-how to manage large and complex projects while taking into account business practices. They can rely on a trusted partner to address their communication needs through a customized solution and a full set of professional services, from conceptual design to turnkey delivery. As demonstrated with the Xi'an Metro Line 2, their rail communication projects are completed according to their schedule and budget and the projects adhere to the most rigorous quality, health, safety and environmental specifications.