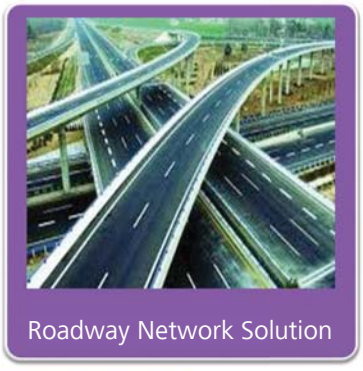
Huawei: Meeting the Network Challenges of the Transportation Industry

Service growth in the transportation industry imposes higher IT requirements and raises new challenges for the bandwidth, stability, and security of the communications network. Based on its years of experience in the transportation industry, Huawei has unveiled a complete set of communications transmission and network solutions, which cover rail transport, metro and light rails, roadways, and airports. In addition, Huawei is leveraging its extensive ICT expertise to help transportation customers build a future-proof integrated communications network. Huawei's "IP+optical" synergy system simplifies the network structure and improves management efficiencies, bringing a "One Net" converged communications service experience to transportation customers.

Huawei provides five major solutions for the transportation industry, as shown below:


Rail Transmission Network Solution


Rail Data Network Solution

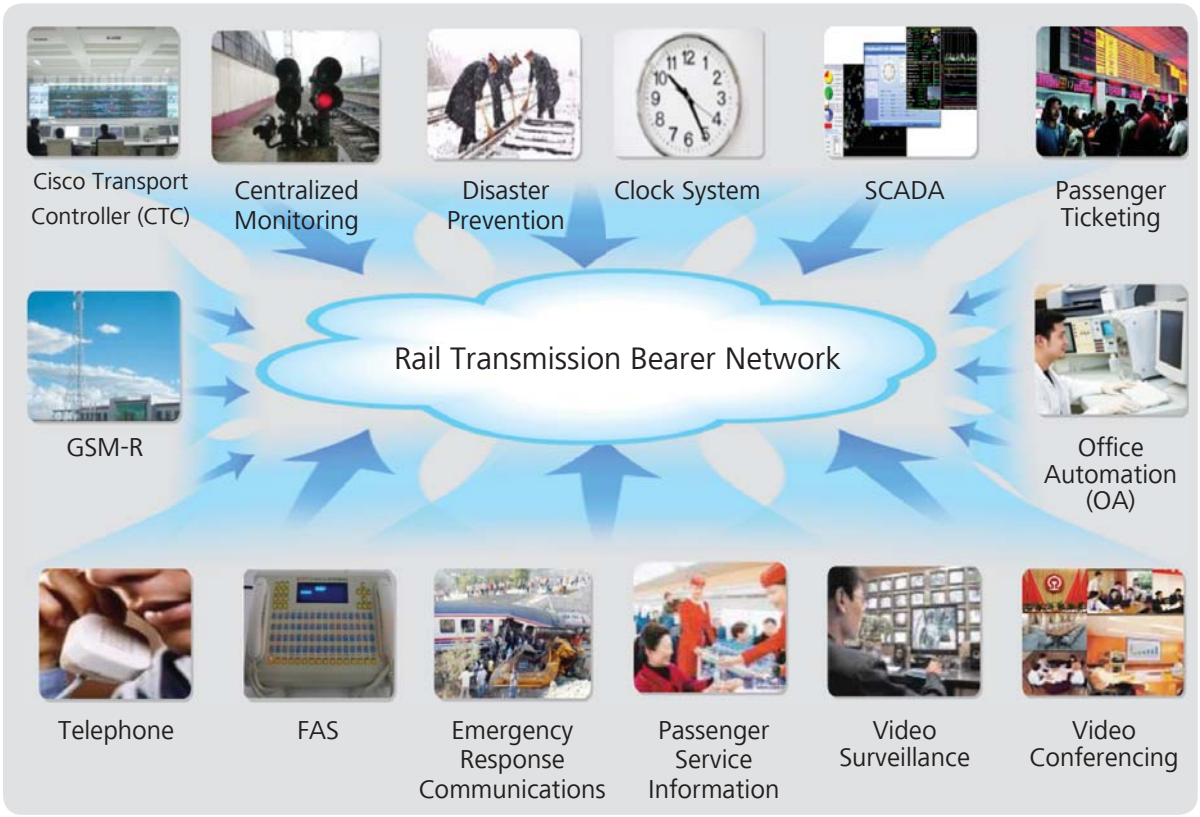

Roadway Network Solution


Intelligent City Traffic Network Solution


Airport Network Solution

Rail Transmission Network Solution

Scenario Introduction

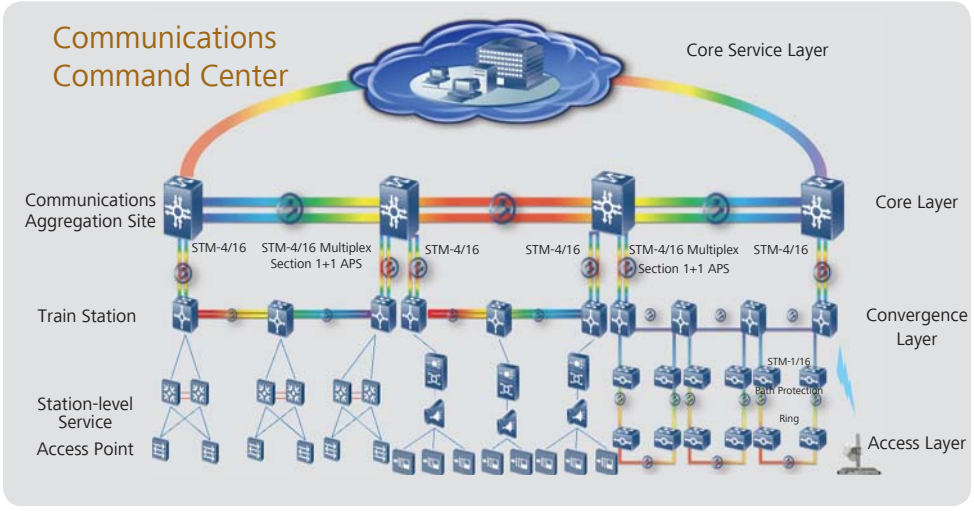


Huawei Rail Transmission Network Solution

Solution Highlights

- Adopts a three-layer structure (access, convergence, and core layers) to carry multiple services, including electricity dispatching, autotransformer, GSM-R station, maintenance center, and repeater station services.
- Sets up a service transmission network with the following features:
  - Network-wide 50 ms protection: Uses a high-reliability ring link topology and industry-leading ring network protection technologies to quickly complete service switching protection within 50 ms from any fault and ensure the continuity of production and dispatching services.
  - Multi-service support: Uses WDM and time division technologies to properly multiplex link resources and carry multiple services, while effectively isolating them from each other. At the same time, it provides abundant interfaces (64 kbit/s to 10 Gbit/s) to connect to all terminals of various interfaces.
  - Ultra-long-distance transmission: Supports more than 1,500 kilometer transmission for sites located far away from each other (for example, convergence sites) to effectively reduce fault points and ensure that service information is efficiently transmitted with the shortest network transmission latency.

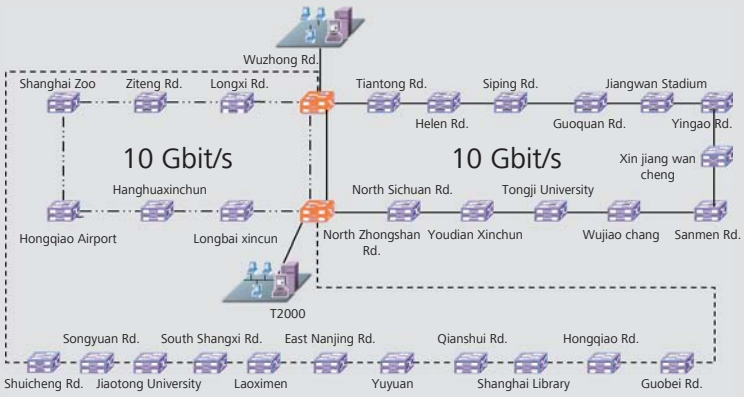
Typical Network Structure and Selected Equipment



- Core layer: OSN8800/6800 and OSN7500/3500
- Convergence layer: OSN8800/6800/1800 and OSN3500/1500
- Access layer: OSN1500/550, RTN910/950/980, MA5683, MA5621 and S5700/S3700
- NMS: U2000

Success Stories

Transmission Network for Shanghai Metro Line 10



Project Background

- By the end of 2010, Shanghai had 11 metro lines with a total length of 410 kilometer, the longest in the world. Line 10, dubbed the platinum line, was 36 kilometers long.
- The traffic flow was massive and the train density was very high; therefore, the client required a higher reliability network.
- Services had to be strictly isolated to prevent correlative errors.

Huawei Solution

- Used a 10 G MSTP system.
- Provided a network-level protection mechanism through a protection ring (TDM) and an embedded RPR ring (Ethernet).
- Offered a device-level protection mechanism via a 1+1 hot backup for SCC, XCS, power supply and time synchronization boards.

Customer Benefits

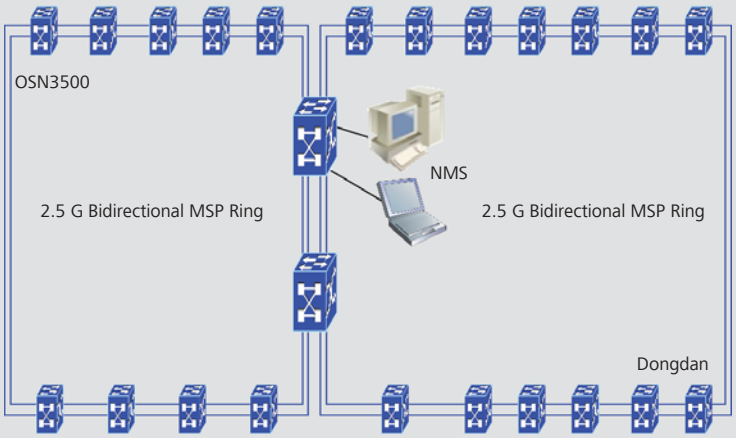
- A large-capacity 10 G system, which can be configured as a public and confidential communications system
- Independent VC-n ETH services based on TDM-N
- Switching protection within 50 ms

Rail Transmission Network Solution

Success Stories

Transmission Network for Beijing Metro Line 1 and Line 2

Commercial Transmission System Reconstruction for Beijing Metro Line 1



Project Background

- Beijing Metro Line 1 and Line 2 total 53.54 kilometers and carry two million passengers every day.
- The customer required an efficient transmission network to ensure that the dispatching information concerning Lines 1 and 2 was correctly transmitted.
- The customer wanted to eliminate security risks and provide industry-leading services.
- The customer also hoped to steadily reduce operating and management costs.

Huawei Solution

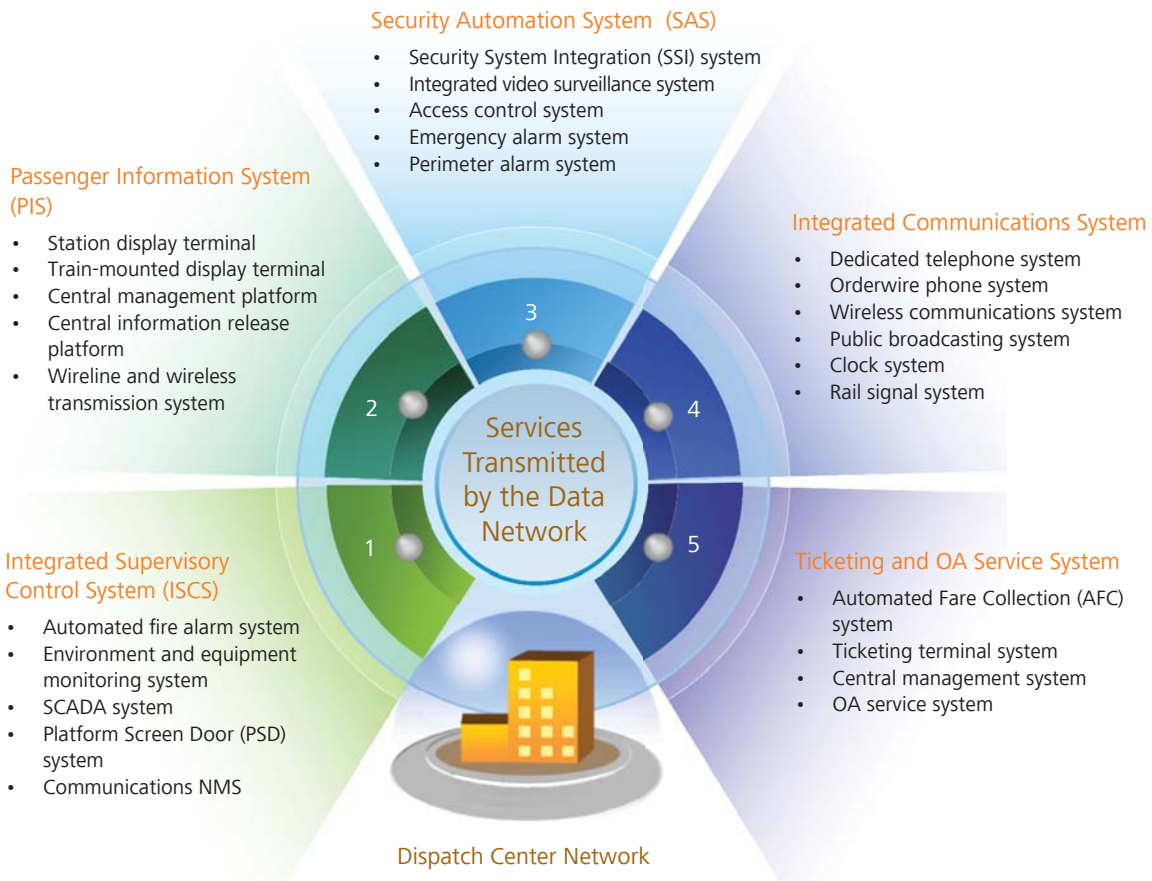
- Deployed Huawei's high-end intelligent optical product, OptiX OSN 3500.
- Used Resilient Packet Ring (RPR) technology to build a reliable ring network.
- Provided a unified service platform to effectively reduce labor and management costs.

Customer Benefits

- Efficient transmission of system operation data (systems include the automated train control system, integrated monitoring system, and other signal and voice systems).
- Improved maintenance efficiency and reduced maintenance costs

Rail Data Network Solution

Scenario Introduction



Rail Data Network Solution

Network Requirements

Reliability

- Services must run without interruption around the clock with immediate system fault recovery.

High Bandwidth and Long Distance

- Video services are growing quickly, as well as the corresponding data, which must be transmitted over long distances.

Low latency

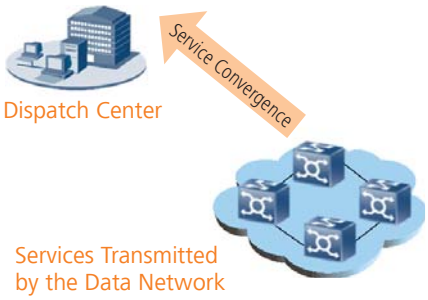
- SCADA and protective relay services require lower network transmission latency.

Multi-service Support

- Network must support multiple services, such as dispatching, monitoring, OA, telephone, and video surveillance services, in addition to multiple types of access equipment.

Network Redundancy Capability

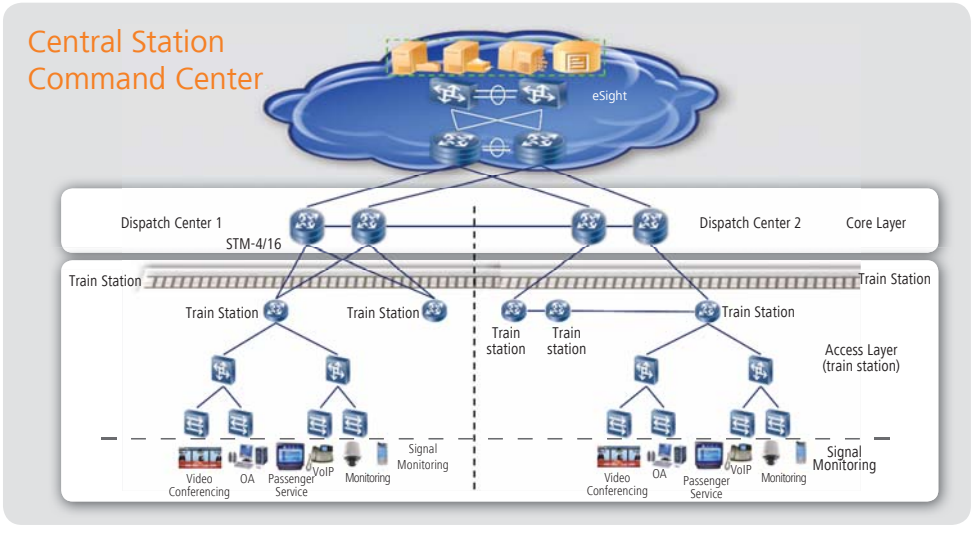
- Services must be converged through multiple nodes to prevent shutdown of all services due to a Single Point of Failure (SPoF).



Solution Highlights

- The data network for rail transport is functionally segmented into four smaller networks: the data network, the dispatching network, the ticket network, and the safety network. For service security and reliability, the four networks operate independently. Of the four networks, the data network carries the most complex services, supports the greatest number of network clients, and requires more VPN and QoS operations.
- Investment on the data network generally covers three layers, as follows:
  - Central station command center: Each dispatch center along the railway lines connects to the central station command center using two channels. These dispatch centers also connect each other in a partial mesh structure to ensure network reliability.
  - Railway data network: This network is built using egress routers at train stations and core routers at dispatch centers. Based on optical fiber resources, train stations and dispatch centers can connect to each other using local direct connection and dual-homing mode or local chain homing mode.
  - Station LAN: This network is generally built in conjunction with basic station facilities, aiming at building a security access network that supports multiple terminals and services. Access routers are deployed at egresses of train stations to converge all train station traffic.

Typical Network Structure and Selected Equipment



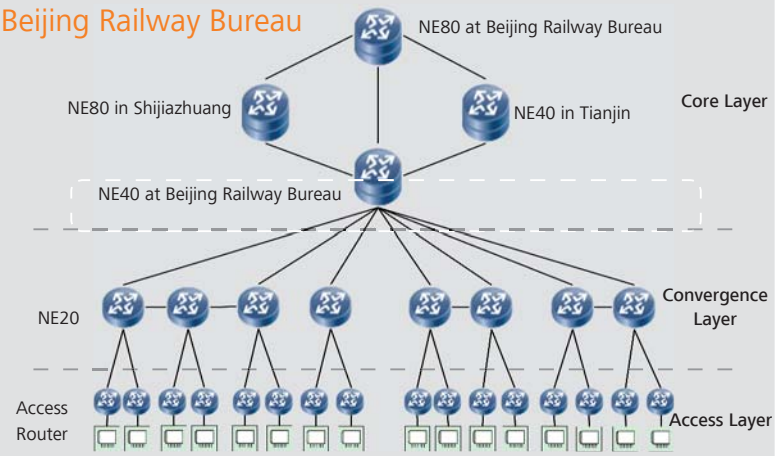
- Central station command center: S9700 and NE40E-X16/X8
- Dispatch center (core layer): S7700/S9700 and NE40E-X8/X3
- Station LAN (access layer): AR G3, S7700 and S5700
- NMS: eSight

Rail Data Network Solution

Success Stories

IP Data Network for Beijing Railway Bureau

IP Data Network for Beijing Railway Bureau



Project Background

- Beijing Railway Bureau needed to further consolidate network resources to implement its IT transformation initiatives due to insufficient bandwidth and coverage of its original WAN network.

Huawei Solution

- Used MPLS VPN technology throughout the network to achieve security isolation and information sharing among different virtual networks.
- Used Huawei's high-end router, NE80, as the core router to provide multiple services and applications, including TMIS, TDCS, PMIS, OMIS and 5T.

Customer Benefits

- Improved network reliability and availability
- Enhanced network security
- Achieved better network monitoring and management.

Success Stories

Transmission Data Access Network for Kunming Rail Transit

Project Background

- The information network system constructed during the Kunming Rail Transit Line 6 project (phase I) was an OA and enterprise resource management system.
- The main function of this information network system was to consolidate enterprise-wide information resources, promote information sharing, and make service processes more intelligent and to make operation and management more IT-based.

Huawei Solution

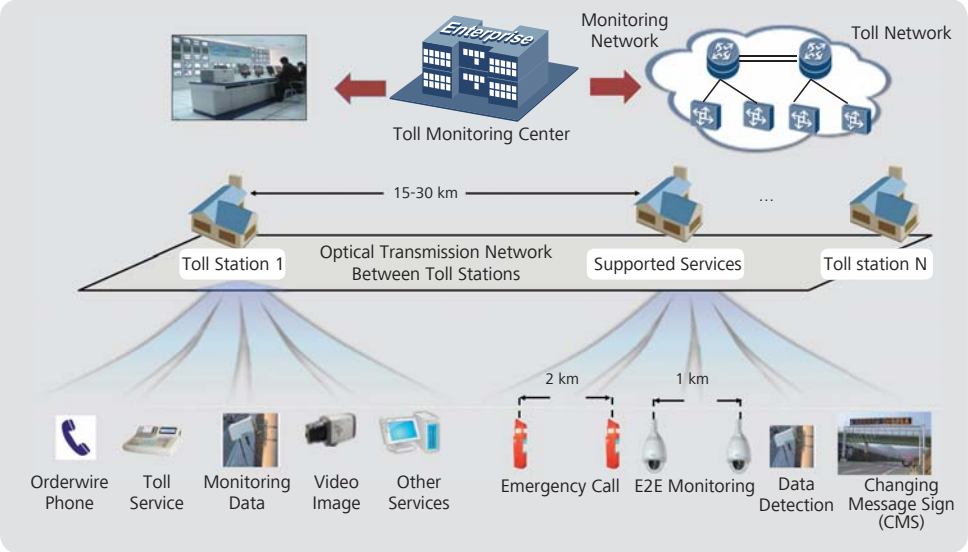
- Used Huawei's S7712 switch as the core switch and connected the control center and switches at train stations through optical fibers.
- Deployed Huawei's S5700 GE L3 switches at the control center and train stations and connected these switches to the core switch through GE Ethernet.

Customer Benefits

- Higher network security and better virus prevention through the DAI function enabled on the S5700 and S7700 switches
- Higher network reliability and stability

Roadway Network Solution

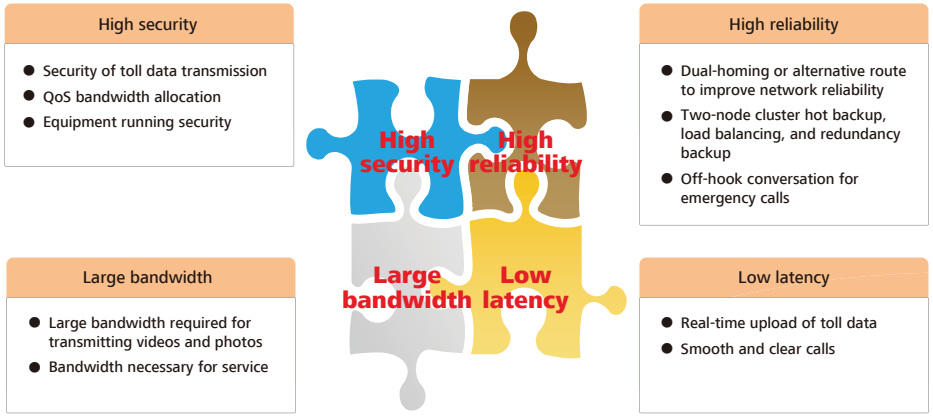
Scenario Introduction



Network Requirements

The roadway communications system carries integrated roadway services, including toll, voice, monitoring, emergency call, and OA services.

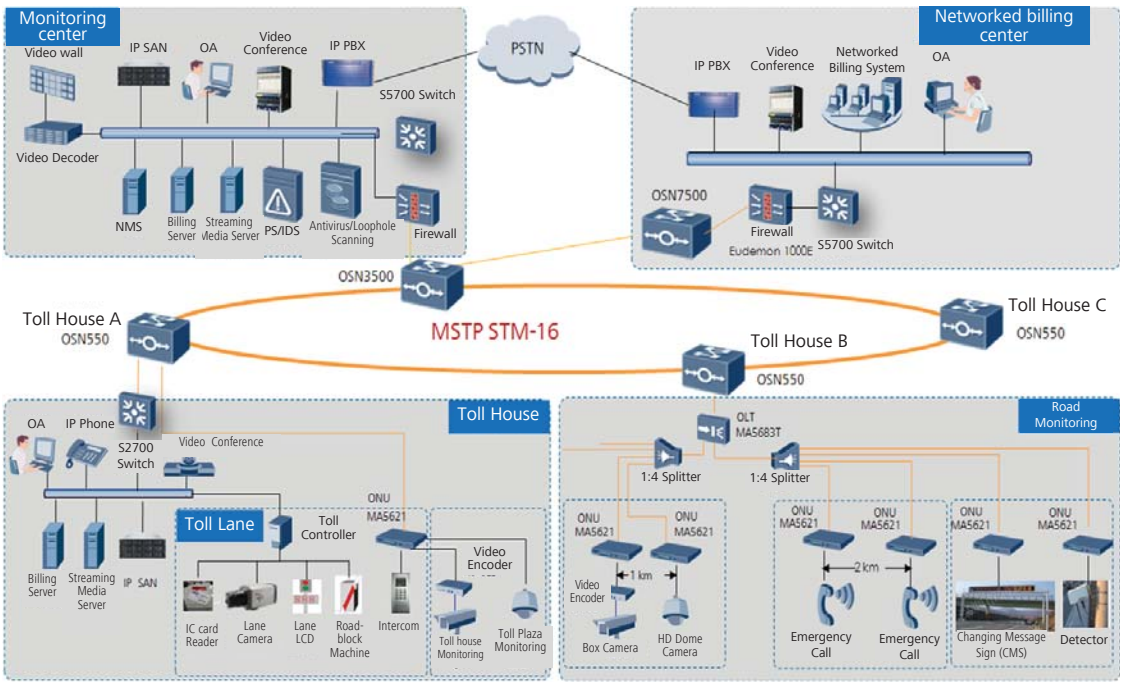
- This system must ensure the security and reliability of service data.
- The system must have good scalability and compatibility.
- The system must be easy to manage, and its services must be clearly defined for easy operations.



Solution Overview

- Roadway IT transformation covers the roadway toll system, monitoring system, and communications system. Among them, the communications system consists of the transmission system, access network system, voice switching system, emergency call system, video conferencing system, OA system, communications power supply system, auxiliary equipment system, and optical and electrical cable system.
- The roadway communications network is segmented into two layers:
  - Transmission layer: Uses MSTP technology to isolate various services (such as toll, monitoring, and telephony services) from each other and designs different channels to carry these services, ensuring data security and reliability.
  - Access layer: Uses PON technology to support surveillance and voice services, as well as information collection and display. Deploys switches to support OA, telephone and toll services of toll stations and exchange data with the monitoring center throughout the transmission network.

Typical Network Structure and Selected Equipment



- Monitoring center: AR G3 and S9700/S7700
- Backbone transmission layer: OptiX OSN 7500/3500/550
- Toll station access layer: S5700, S3700, MA5683 and MA5621
- NMS: U2000

Roadway Network Solution

Success Stories

Integrated Communications and Monitoring Network for Beijing-Qinhuangdao Expressway

Project Background

- Total 199 kilometer and 12 toll stations.
- The customer wanted to build a highly reliable and stable communications system that supported multiplexing protection.
- This expressway was an important traffic line between the Olympic host city Beijing and Olympic co-host cities of Tianjin, Qinhuangdao and Shenyang.

Huawei Solution

- Used Huawei MSTP equipment (including OSN3500 and OSN1500) for the transmission system and the access network. In addition, Huawei built an STM-4 two-fiber self-healing ring and deployed GPON equipment to support high-speed service access and transmission.
- Provided an H.264 digital solution.

Customer Benefits

- Enhanced network reliability and a network free from the impact of node bottlenecks and multiple failures
- Stronger scalability and more flexible network expansion and upgrades, laying a solid foundation for multi-service access
- Higher network resource utilization.

Success Stories

Communications System for Changde-Jishou Expressway, Hunan Province, China

Project Background

- The project included a total of 223.7 kilometers, four lanes (two in each directions), 34 tunnels, a designed speed of 80 km/h and a total investment of about CNY10.65 billion.
- The communications system to be built needed to be highly reliable and support multiplexing protection due to the challenging hilly terrain.
- The communications system also needed to support transmission of multiple services, including video surveillance, and voice services.

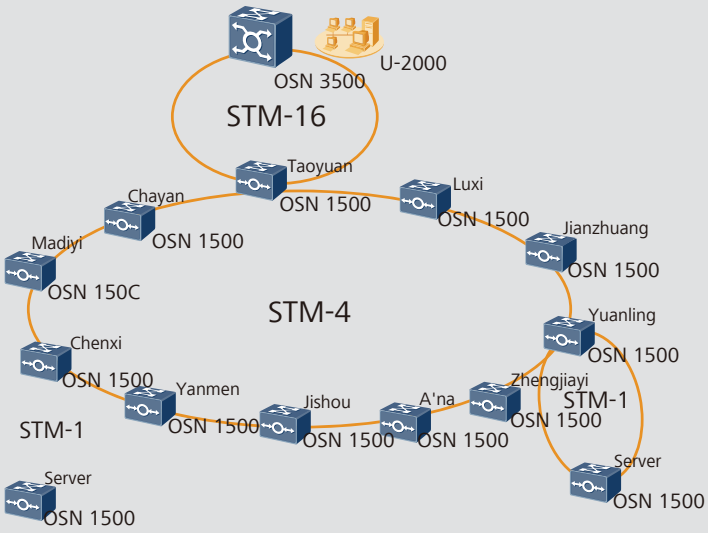
Huawei Solution

- Used Huawei MSTP equipment (including OSN3500 and OSN1500) for the backbone transmission system and the access network. In addition, Huawei built an STM-16 MSP ring for the backbone and constructed an STM-4 two-fiber self-healing ring to support high-speed service access and transmission.
- Used MSTP technology, supported multi-service access, and allowed for hierarchical service protection and quick access of emergent services.

Customer Benefits

- A reliable and stable transmission platform for the expressway monitoring system and toll system
- Secure, stable and economical communications service assurance
- A solid foundation for the future construction of more intelligent networks

Changde-Jishou Expressway Management Center

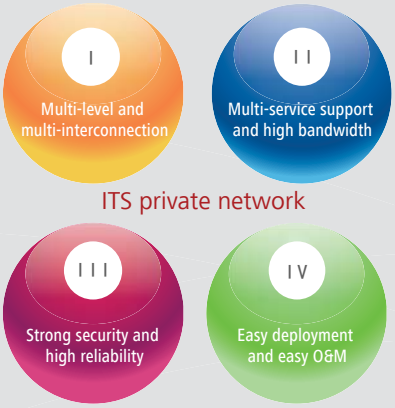


Intelligent City Traffic Network Solution

Scenario Introduction

Network Requirements

Multi-level access and aggregation must be supported. At the same time, the system must be able to exchange data with other systems, such as the e-Government system, the Internet, the broadcasting system, and the telecom system.



More bandwidth resources are required to support a variety of video, voice, data, HD, 3D, and Internet of Things (IoT) services.

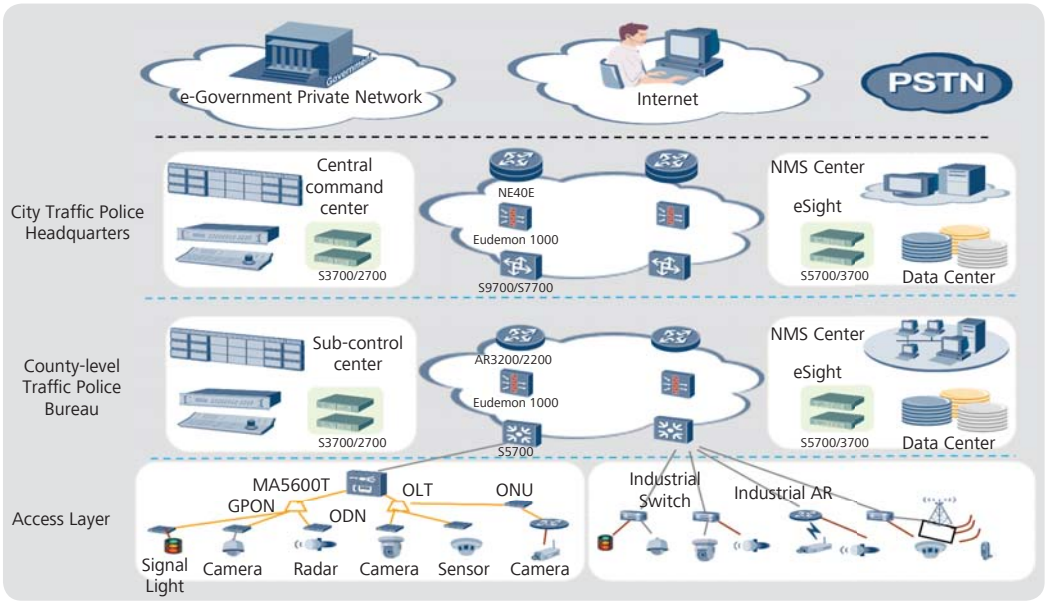
The entire network must be highly secure to ensure the security of equipment and links.

A unified management platform is required to uniformly manage diversified services and equipment from different vendors. In addition, services must be easily and quickly provisioned.

Solution Overview

- This solution uses a three-layer (province/state-city-county) structure and provides services to the public and employees through the Internet. Internal networks include the OA network, service network, city-level/county-level data center, and NMS center. The access network supports multiple types of terminals and access modes, such as wireline and wireless.
- The city-level network consists of a command center, an information release center, a data center, and an NMS center. This network is horizontally segmented into the access, convergence and core layers, and vertically divided into an OA network, a security network, and a service network. The egress of this network connects to the external e-Government private network and the Internet. WLAN access is supported inside the network. The city-level network can directly manage and monitor county-level networks.
- Road information can be quickly converged to the city-level command center through a private network. This information then passes through the data center and is intelligently processed by the information processing platform. As a result, the command center can quickly learn about the information and release it to the public in the earliest possible time. In addition, the public can proactively query road information through the network platform.

Typical Network Structure and Selected Equipment



- City/District monitoring center (core layer): S9700/S7700/NE40E
- Monitoring center (convergence layer): S5700/OLT/AR G3
- Road intersections (access layer): industrial switch/GPON MA5626 and MA5621
- NMS: eSight

Intelligent City Traffic Network Solution

Success Stories

Maldives Intelligent Traffic Project

Project Background

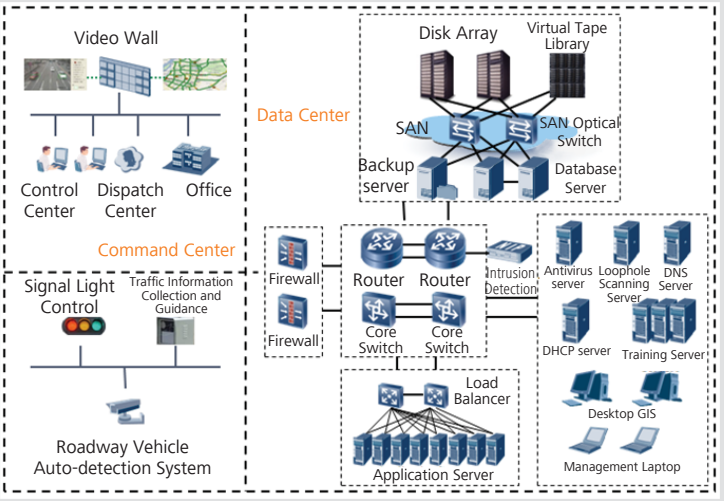
- In Maldives, the number of traffic vehicles had increased, including motorcycles. Traffic violations had also sharply increased, resulting in many traffic accidents.
- Citizens, tourists and visitors complained about excessive speeding.
- The monitoring equipment was old and could not ensure efficient traffic control.
- Information silos resulted in ineffective information sharing.

Huawei Solution

- Provided a high-definition (HD) electronic police system, an intelligent signal control system, a speeding detection system and an intelligent traffic management platform.

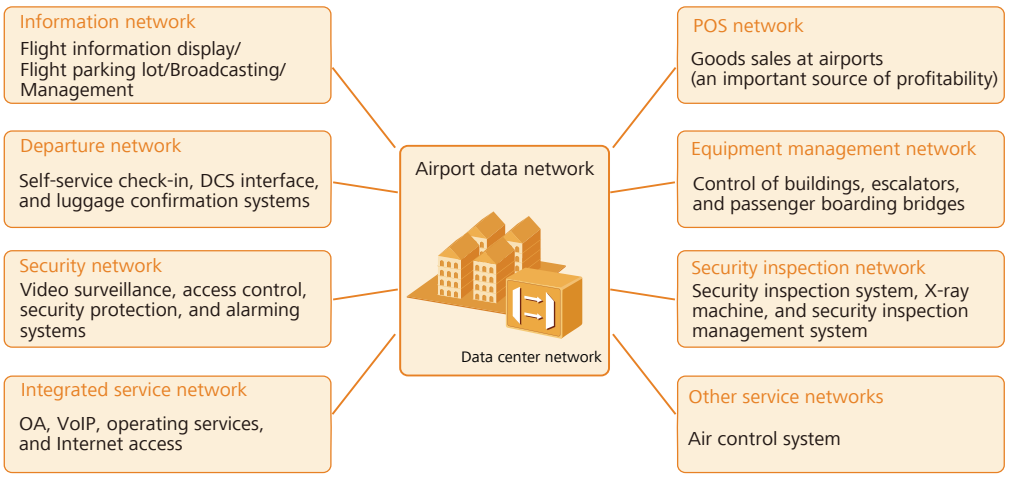
Customer Benefits

- Better resource utilization and improved user experience
- Lower energy consumption and reduced environmental pollution
- Enhanced efforts to combat traffic violations and reduced workload for traffic police



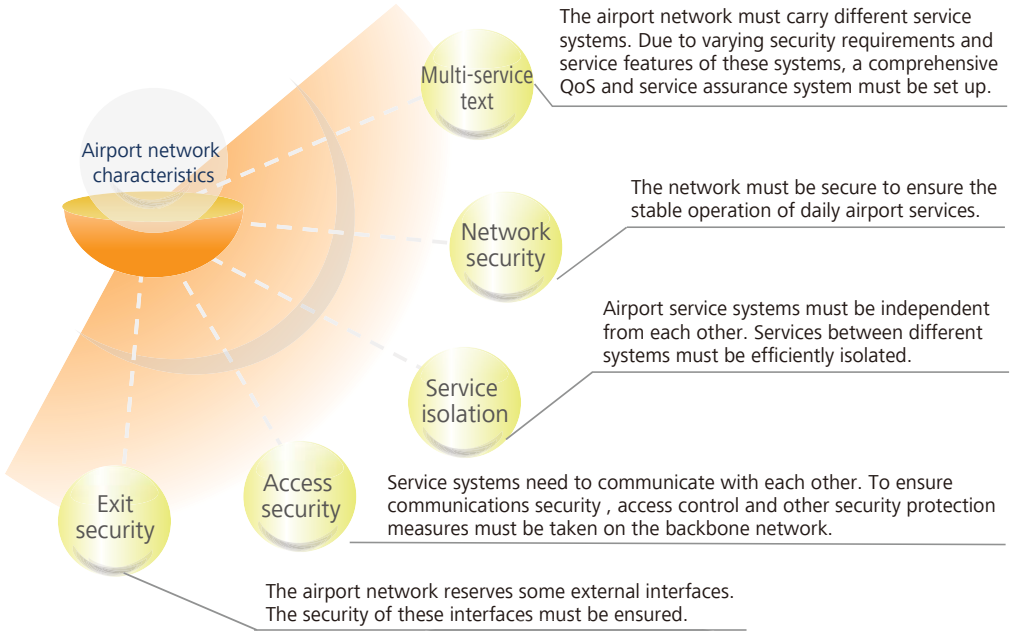
Airport Network Solution

Scenario Introduction



Airport Network Solution

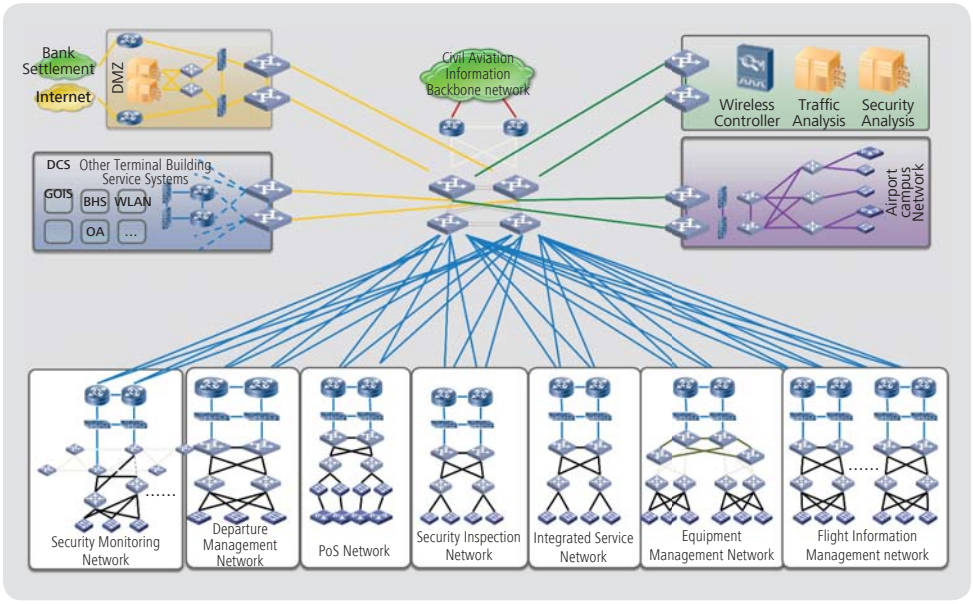
Network Requirements



Solution Overview

- The airport network can be classified into the following subnetworks:
  - Information system integration network
  - Departure information management and release network
  - Security inspection service management network
  - Security inspection information management network
  - Security service bearer network
  - PoS network
  - Integrated service network
  - Dedicated equipment network
- Network characteristics: To ensure security, service areas are independent from each other. The CSS+iStack virtualization networking mode is adopted for network stability. Hardware-level OAM+BFD detection technologies are used for high network reliability.
- Vertical virtualization: Multi-equipment and multi-link protection ensure easier network management and maintenance.
- CSS cluster: Ensures equipment stability and reliability, and provides ultra-large cross-equipment switching capacity.
- Hardware-level OAM+BFD: Precisely binds a large number of sessions to each equipment port, user and service, achieving quick alarming and service switchover.

Typical Network Structure and Equipment



- Terminal building core/Subnet core layer: S9700
- Subnet convergence layer: S9700/S7700
- Subnet access layer: S5700/S3700
- Wireless access: AP6010/6310SN, AP6510/6610/7110DN, WS6605 AC and S9700 (WLAN AC card)
- NMS: eSight