



# Huawei Railway Security Video Surveillance Solution



HUAWEI TECHNOLOGIES CO.,LTD.

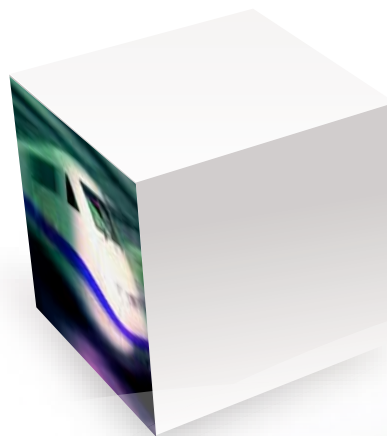




# 1. Preface

Maintaining efficient rail operation at highest levels of customer satisfaction are important benchmarks for modern railways working in a competitive market. Many rail operational areas are already well covered through with dedicated telecommunication solutions such as eWBB, Passenger Information Systems and railway multi-service bearer networks. Huawei's Video surveillance solution for Railways is a further area where Huawei helps railways to achieve their operational targets. Digital video surveillance provides direct access to information relevant to supervise and adapt ongoing railway operation. Automatic processing of this information can be used to provide decision criteria for traffic scheduling, advanced passenger and crowd management inside stations and on platforms. Modern video analysis tools access these video streams and can automatically provide supportive information relevant to disaster prevention, access control for passenger and freight services on board and to ground based staff.

Based upon more than 20 years' experience in the information and communication fields and more than 10 years of experience with Railway communication solutions Huawei today offers a comprehensive range of communication solutions specifically designed for Railways. Huawei railway intelligent security video monitoring allows long-range, large-scale, multi-level linkage architectures thanks to its intelligent, high-definition, high-reliability hardware design.



## 2. Railway security in mind:

Public rail transport is one of the most important transport modes to counter congestion and pollution from the road or aviation sector. Ensuring passenger and cargo transport is running smoothly safety relevant communication systems have already been put in place in most railways. However, these system provide very little information about the situation of passenger and cargo using the train. To ensure security of passengers and cargo other measures are taken such as security staff, fencing and access control to secure locations. Such measures are efficient but costly to maintain. Huawei's Video Surveillance solution provides a cost efficient solution ensuring security of passengers and cargo.

Typical Railway Video Surveillance solutions require large-scale, long-distance, multi-service scenarios. Most commercial of the shelf Video Surveillance solutions are designed to cope with typical SOHO or home use environment. Taking security seriously geographical redundant control centers with multi user and hierarchical rights management are required to control, monitor and access video storage facilities. For this reason Huawei's Video Surveillance Solution makes use of our scalable Data Solution based on our Cloud Computing architecture.

Besides the specific rail demands on size and architecture Railway use requires high-definition video streams for scene playback, post incident investigation and data collection. Our intelligent analysis platform allows retrieving of large scale video data for automated video analysis and support implementation of an alarm and early warning systems for Control Centre Staff. Huawei's Video Surveillance Solution is designed to cope with stringent demands on transmission, processing and storage of high-definition videos.

Digital video processing with its intuitive, easy storage, retrieval and sharing features, has become an important part of the railway video surveillance solution. Authorized staff can access remote monitoring through centre terminals or mobile devices. The location of the control centre or the creation of a number of geographically redundant control centre are design features that can easily be achieved with Huawei's versatile Video Surveillance Solution. Our Intelligent modular video processing software performs a large number of data analysis on user defined locations in order to improve overall efficiency of the security staff. Key benefits of Huawei's Video Surveillance Solution are:

- Multi-department unified access and information sharing user accounts
- Multi-level management situation specific resources allocation
- Multi-service unified management
- Intelligent analysis: identification, counting automated alarms
- Video playback and post incident analysis
- Opening interface architecture to integrate existing surveillance infrastructure
- Hardware compliant to stringent Railway environmental requirements
- Emergency incident support: Making decisions quickly and handling emergencies efficiently thanks to information obtained from video sources

## 3. Huawei Railway Security Video Surveillance Solution

Huawei Railway security video surveillance system requires underlying broadband wire line or wireless data networks. The system supports real-time monitoring, video storage, video retrieval, playback, PTZ camera control and many more basic and advanced functionalities. All these functions require a network architecture that is designed taking into account strong demand of video processing to the bearer network as depicted in Figure 1 below.

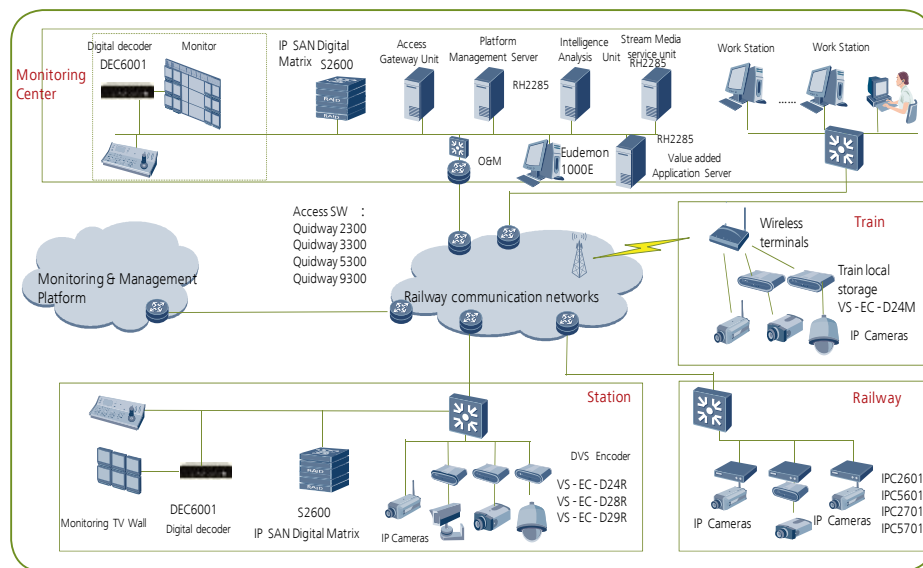


Figure 1: Huawei Railway Security Video Surveillance Solution Overview

## 3.1 Front-end

The Front-end system is mainly composed of the individual cameras and the associated access system.

### In the stations

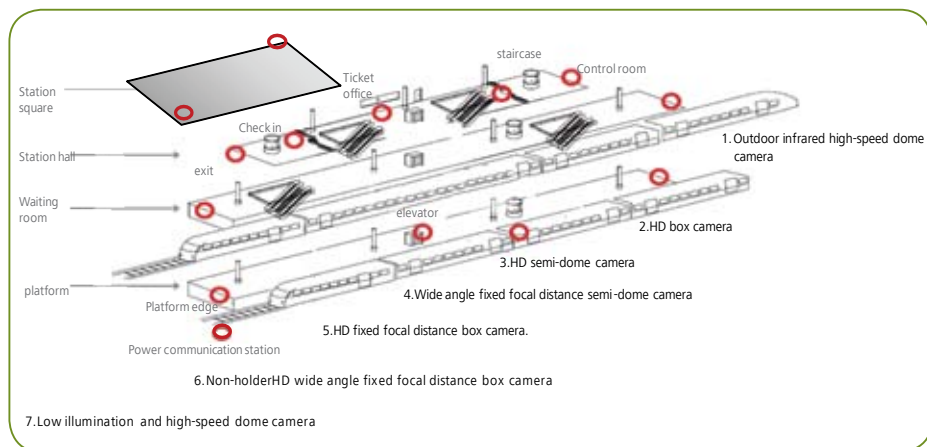


Figure 2: Front-end system in the stations overview

### Solution Highlights:

- H.264 video encoding and decoding for High stream playback, low-stream storage;
- Intelligent analyzing software in application layer allows processing of HD streams to further improve improve of detection algorithms.

### In sections:

Video surveillance systems are used in Tunnels, Bridges, railway level crossings, platforms and other “hot-spots”. A vast variety of cameras can be deployed depending specific requirements of their location i.e. infrared, adjustable focal points, long distance zoom and maximum scope monitoring. High anti-seismic/anti-shock/dustproof and rain-proof features allow all-weather monitoring 24/7. Software features such as contrast ratio; automatic multicolor to black and white during night as well as other correction algorithms are supported.

### On the train:

Establishing real time Video surveillance on board the train is one of the most challenging scenarios in the railway environment. Thanks to Huawei's eWBB solution the bridge between train based and ground based Video Surveillance infrastructure can be established using state of the art capabilities of Huawei's in-house LTE technology. Typical mounting points for Video Surveillance equipment are forward and rear looking cameras within the locomotive as well as cameras inside the passenger carriages or drivers cab. In railway carriages and inside the cab, "fisheye" or wide-angle domes are widely used; hidden high-speed HD Cameras are preferred to monitor entrance areas for people counting and for baggage areas. Anti-seismic/anti-shock characteristics ensures given camera reliability throughout their lifetime.

### Solution Highlights:

- eWBB transfers real time video streams from train to ground;
- Wide choice of camera and lens types for various on board scenarios;
- Versatile on-board off board data storage facilities and synchronization mechanisms to minimize impact to train to ground communication.

## 3.2 Huawei's Railway Bearer Network Solution

Huawei's Railways Bearer Network Solution allows Railways to maximize use of their fixed network infrastructure. The Fixed network infrastructure combines transmission demands for a multitude of data and voice services used in the railway environment. The system is required to provide best QoS figures, easily to manage and versatile in regards to supported services like Video Surveillance.

### Typical Railway Bearer Network Architecture:

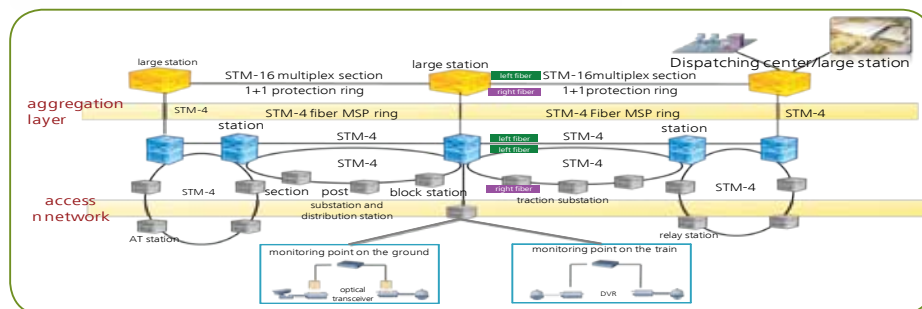


Figure 3: Huawei Intelligent security video surveillance bearer network overview

### Solution Highlights:

- Multidimensional protection strategy: multi-ring network protection, equipment protection with backup of key unit, TPS business protection and geographic redundancy concepts
- Powerful capability of network management, end-to-end deployment and maintenance.

## 3.3 Wireless Bearer Network

For high-speed trains, HRC (High-Speed Railway Communication) using TDD HS-OFDM technology is considered the most suitable means to achieve broadband transmission for real-time train to ground video monitoring scenarios.

### Typical Network:

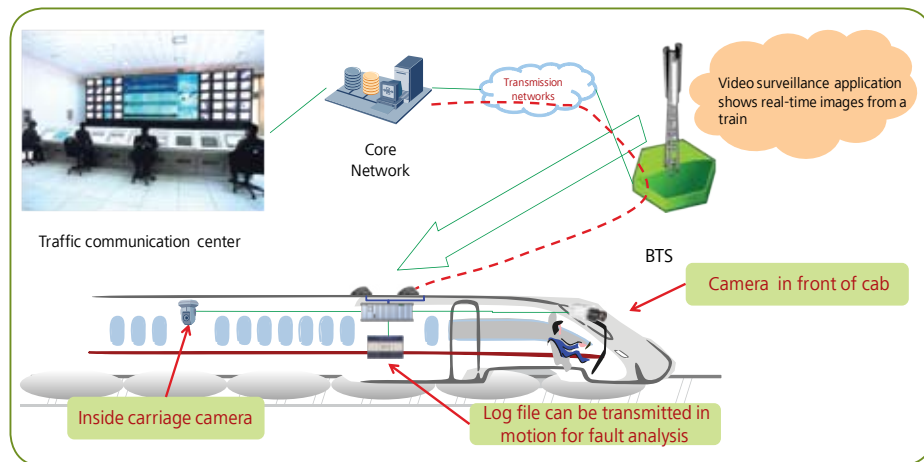


Figure 4: Huawei Intelligent security video surveillance wireless network overview

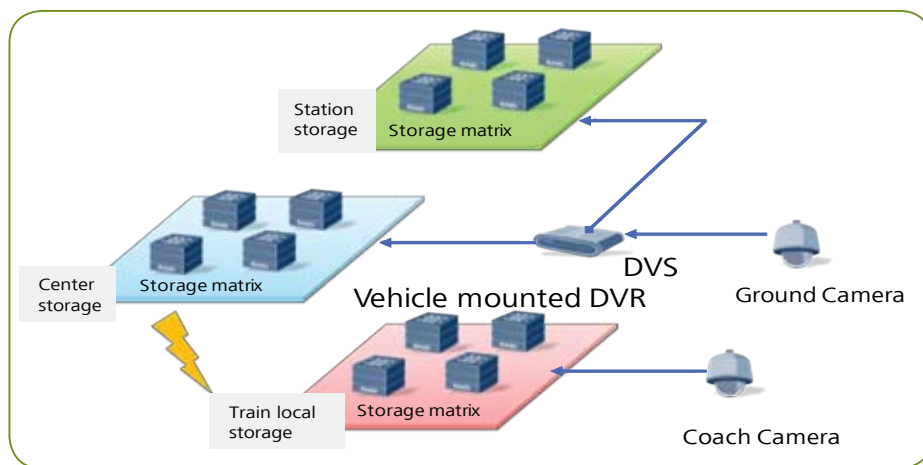
### Solution Highlights:

- **Access to wide data bandwidth:** Achievable travel speeds of 500km/H; flexible Data bandwidth of up to 100Mbps; Support of multi-system transmission pipes for variety of voice and data services.
- **Flexibility network design:** All IP design, compatible with current GSM-R and future Rail telecom access modes. Allows smooth upgrade to current or future requirements. Flexible spectral bandwidth assignment 1.6M-20MHz, support multi-carrier(2\*20M).
- **Overall networks performance better than traditional solution:** Flexible configuration of UL/FL frame ratio allows optimizing the system to asymmetric data profiles of multiple voice, data and video services on board the train. Considered latest generation of air interface technology with most efficient use of spectrum.
- **Reduced operational cost:** LTE based solution allows single Radio access concepts with GSM-R, GSM and UMTS services. Mast sharing, infrastructure sharing and easy migration from GSM-R to LTE based services are supported. LTE based infrastructure requires far less core network technology than traditional GSM-R. CAPEX and OPEX benefits are significant over typical Railways operational lifecycles.

## 3.4 Video Storage system:

Full HD video surveillance streams from hundreds or thousands of cameras like seen in larger scale deployments require state of the art high-capacity & high-performance storage system. Huawei' s Video Storage solution include IP-SAN networks supporting data write speeds of 24GB/S at a single location.

### Typical Network:



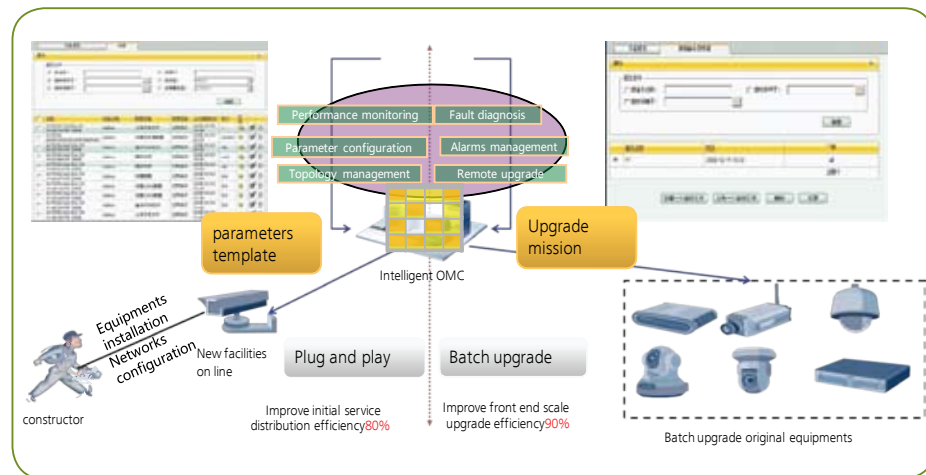
### Solution Highlights:

- Flexible Video stream distribution/forwarding storage
- Multi-level users access management
- Energy conservation mechanisms to lower consumption, extend hard disk lifetime, protect customer investment
- I/O load balancing, multi-routes to application servers, autonomous handover, automatic recovery
- Flexible System performance upgrade under full service with no outage
- Flexible Upscaling of Storage capacity

## 3.5 Intelligent Management Front end:

The Intelligent Management Front-end system is the interface to the station maintenance or railway control center. Also 3<sup>rd</sup> party monitoring and front-end intelligence can be integrated.

### Scenario 1: Front-end intelligent management



#### Solution Highlights:

- Plug and play, simplifies configuration and data fill, simple initial deployment
- Batch upgrade and automatic detection

### Application Scenario 2: Intelligent detection

Huawei's Railway Video Surveillance Solution supports automatic detection of pre-defined situations. User defined acoustic and visual alarms can be applied to pre-defined geographical location. Exception criteria as well as response team notifications are fully adjustable.



## 4. Why Huawei Railway Video Surveillance solution?

Huawei railway video surveillance solution is an integral part in a complex railway telecom infrastructure. Considerations of existing operational voice and data services and non-critical telecom services are to be taken when implementing resource demanding Video Surveillance solutions. Huawei as an experience telecommunication partner can deliver a Video surveillance Solution for railways supporting:

- **Rich front-end system:** Front-end system using analog cameras (gun type, ball type) Standard definition IP Camera, HD IP Camera, DVS / DVR and other devices. Front-end audio and video streaming as well as alarm information acquisition and encoding.
- **Highly reliable architecture:** Huawei products have been designed to deliver 99.999% reliability. System reliability can further be improved through geographically redundant architectures.
- **High-speed train real-time monitoring:** HRC (High-speed railway communication) system provides a reliable train to ground communication channel for real-time video surveillance. OCC staffs have direct access to on board Video Surveillance video streams and management functions.
- **Efficient and effective storage:** Huawei enterprise-class storage solution provides a safe and efficient way to store video streams allowing OCC staff to efficiently access and manage the Video Surveillance System.
- **Open, easy to upgrade and easy to manage:** Huawei's Video Surveillance solution is based on an open architecture, easy to be integrated and expanded to a large variety of applications. The modular design, and rich functions allow efficient and multi-level management access.

Huawei solution fulfills your requirements railway video surveillance applications. With the help of experienced local partners, we provide a highly reliable and high performance system.

## 5. Success story

Huawei to build a safe and efficient Turkey "Orient Express"

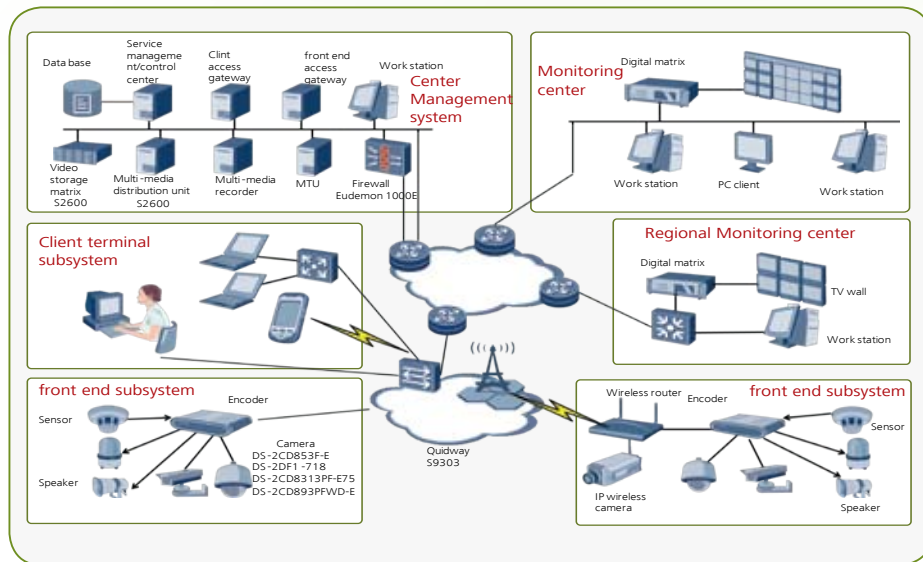
- Turkish TCDD railway monitoring project

TCDD is a state-owned railway company which belongs to Turkish Ministry of Transportation.



In 2010, TCDD began to build a high-speed rail from Ankara to Istanbul. This line is 270km long, and used for passenger and freight transport. Along the line there are five stations with an annual traffic forecast of 17 million passengers. In order to support its services along the line TCDD demanded a real-time video surveillance system for key areas and sections of this line. The system is required to support intelligent service such as intrusion detection.

Huawei designed an overall video surveillance solution for TCDD, which used 31 sets of DWDM ring transmission networks as the backhaul. A set of 390 IP cameras on both sides of the railway, level crossings and key sites are feeding video streams into the system. Two geographically redundant monitoring centers one in Ankara and the other one in Istanbul provide a reliable and resilient solution for 24/7 monitoring. Besides the control centers and video storage the solution also runs intelligent analysis of intrusion detection with automatic alarms.











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