

Comprehensive Network Solutions for the Energy Industry

Oil and gas are indispensable natural resources, playing a huge role in the world economy. Securely and efficiently exploiting, transporting, processing, and selling oil and gas products and services is essential to success in this very competitive industry. Based on the unique needs of the oil

and gas industry, Huawei has launched a series of network solutions, specifically designed for the upstream, midstream, and downstream components, helping energy customers improve ICT efficiencies and enhance profitability.

Huawei provides four major network solutions for the energy industry, as shown below.



Notes: Focus is on land, oil, and gas field network construction. Mineral campuses have similar network structures as oil and gas field campuses; therefore, networks for mineral campuses are not described.

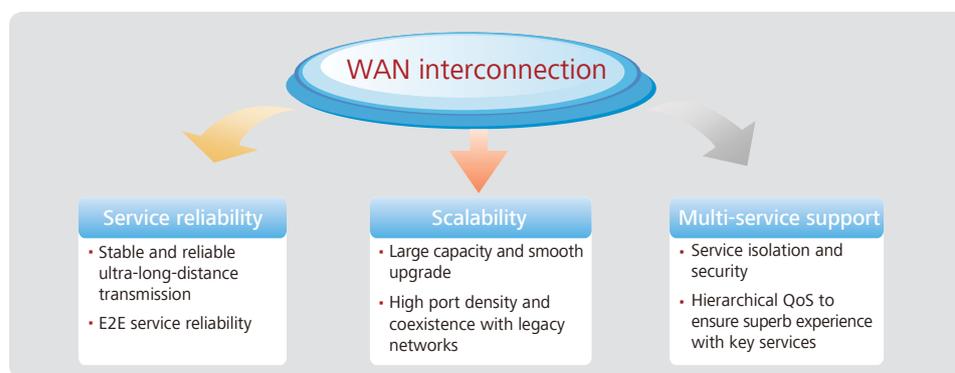
WAN Interconnection Network Solution

Scenario Introduction

The WAN interconnection network for oil companies is used between HQ and branch organizations such as oilfield companies, pipeline offices, refineries, exploration and exploitation bureaus, and design institutes. This network carries oil companies' IT-based services, including

production, scheduling, and OA services. An optical transmission network is normally built using optical resources routed along oil and gas pipelines.

With the fast development of multiple large-capacity services, WAN interconnection increases requirements for equipment, as shown in the following figure:



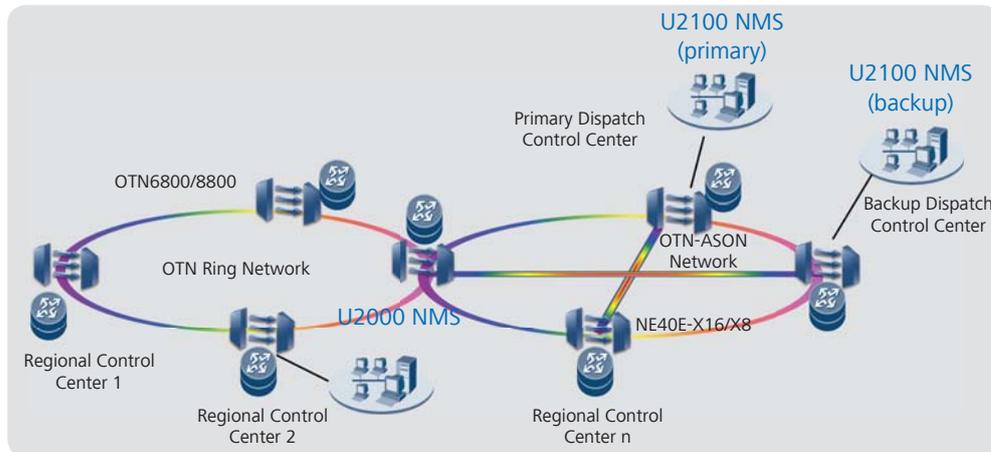
WAN Interconnection Network Solution

Solution Introduction

Huawei's WAN Interconnection Network Solution for the energy industry includes the following architectural components:

- **Transmission network:** Uses standards-compliant OTN technology to support large-granularity services (such as core dispatch, video surveillance, and HD video conferencing) and enables ASON functions to ensure security and reliability. In addition, this solution supports ultra-long-distance transmission, which reduces the number of electrical regenerators and lowers operating costs.
- **Data network:** Uses core routers to build an IP/MPLS network and supports BFD and quick route convergence to ensure security, reliability, and redundancy backup.
- **Network management:** Uses a network element (NE)-level NMS system for each regional control center and adopts a network-level NMS system for the corporate dispatch control center to uniformly manage regional NMS systems. In addition, two-node cluster hot backup is deployed to improve system reliability.

Typical Network Structure and Equipment

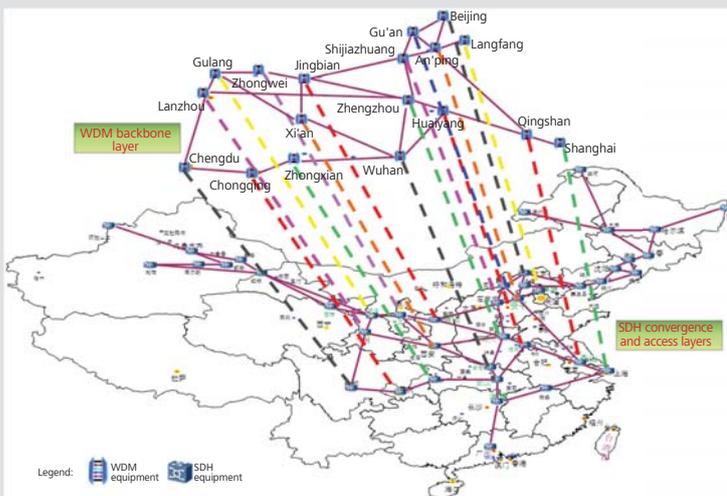


- Transmission network: OSN8800/6800
- Data network: NE40E-X16/X8
- Unified NMS: iManager U2100/U2000

WAN Interconnection Network Solution

Success Stories

National Backbone OTN Transmission Network for CNPC



Project Background

- China National Petroleum Corporation (CNPC) is the largest crude oil and gas producer and supplier in China.
- Its previous optical communications network provided small bandwidth and, therefore, did not support bandwidth-hungry services.

Huawei Solution

- Deployed about one hundred OSN 8800 and OSN 6800 devices to cover a total network length of approximately 8000 kilometers.
- Provided a 40 x 10 G platform to support large-capacity bandwidth requirements.
- Used Huawei's OSN 8800 product (with 1.28 T cross-connection capability) to flexibly groom and efficiently protect multiple services.

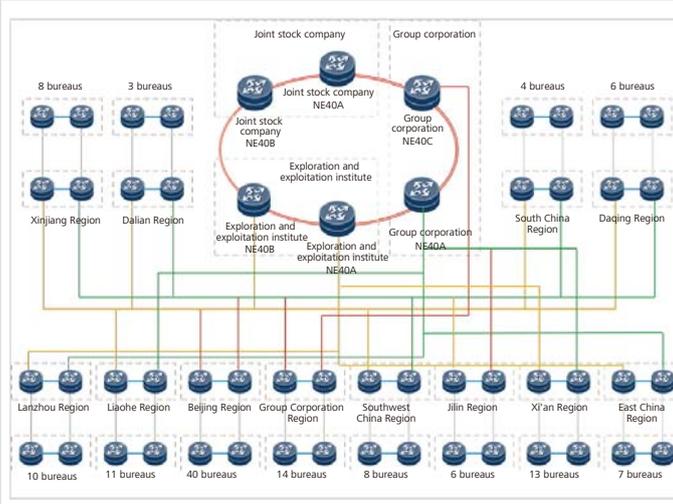
Customer Benefits

- Sufficient bandwidth resources that meet network development requirements for the next five years
- Strong pipeline protection through unique WDM protection technologies
- Solid foundation for future IT transformation



Success Stories

WAN Interconnection Data Network for CNPC



Project Background

- CNPC's WAN was in a three-level (HQ, regional center, and local center) structure, which connected 205 branches in 12 regions, with Beijing HQ at the core of the WAN.
- CNPC planned to build a highly reliable, integrated bearer backbone network, with no single point of failure and 24/7 service availability. In addition, key services, such as video services, needed to be ensured and links needed to be load-balanced to prevent wasting resources.

Huawei Solution

- Deployed about one hundred NE40E, NE80, NE40 and NE20 devices, used RPR networking for the core and adopted redundancy backup design for all nodes and links to ensure network reliability and prevent single points of failure.
- Gradually implemented NE40E devices for regional nodes to build RPR ring networks.
- Deployed hierarchical QoS (HQoS) to differentially schedule services and ensure the QoS of key services.

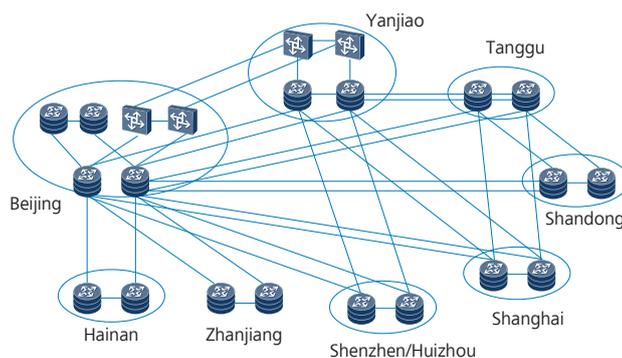
Customer Benefits

- A highly secure, efficient, and manageable IT-enabled system that supports multiple services, enhances OA efficiencies, and improves the company's competitiveness.

WAN Interconnection Network Solution

Success Stories

National Backbone MPLS WAN Network for CNOOC



Project Background

- China National Offshore Oil Corporation (CNOOC) is one of the largest oil companies in China. Its backbone WAN network functions as an important bridge between the HQ data center network and branch networks. CNOOC wanted to turn this backbone WAN network into an MPLS network that featured "physical sharing but logical independence."

Huawei Solution

- Used Huawei NE40E-X8 devices to build the MPLS backbone WAN, covering eight core nodes (Beijing HQ, Yanjiao (disaster recovery center), Tanggu, Shanghai, Shenzhen/Huizhou, Zhanjiang, Hainan, and Shandong).
- Deployed MPLS VPN technologies to securely isolate different organizations and IP services.
- Used end-to-end QoS technologies to meet requirements of different services.

Customer Benefits

- Dramatically improved reliability and performance of the HQ data center
- Greatly improved WAN link bandwidth and reliability of core nodes
- Better multi-service support and QoS assurance through VPN, HQoS, and other reliability technologies

Oil and Gas Pipeline Network Solution

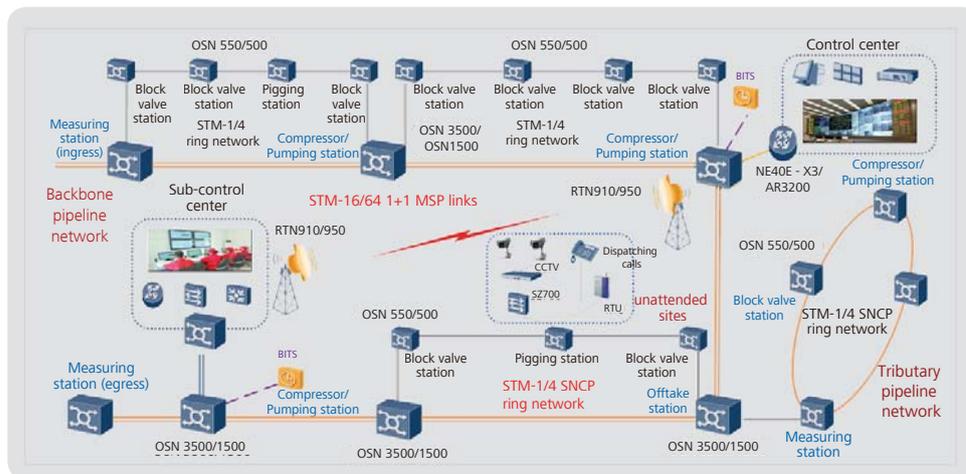
Solution Introduction

Huawei's Oil and Gas Pipeline Network Solution uses the following architecture:

- Tributary pipeline network: Uses MSTP/Hybrid-MSTP equipment to form a 155M/622M ring network and adopts SNCP ring network protection protocols to ensure network reliability.
- Backbone pipeline network: Uses MSTP/Hybrid-MSTP devices at backbone nodes to form a 1+1 MSP chain network and provides a network bandwidth of 2.5 G/10 G. 155M/622M ring networks are set up at unattended sites. A dedicated board isolates and protects SCADA service data. Microwave is deployed to back up key services, such as SCADA, and to provide access for non-optical sites.

Data network: Uses datacom devices (including switches and routers) at attended and unattended sites to forward production services (SCADA, industrial TV monitoring, dispatch telephony, etc.) and OA services (video surveillance, administrative telephone, etc.) to the transmission network.

Typical Network Structure and Equipment



- Tributary pipeline network: OSN500/550 and RTN910/950
- Backbone pipeline network: OSN7500/3500/1500 and RTN910/950
- Data network: S2700/5700/9700, industrial switch, NE40E-X3, and AR2200/3200

Oil and Gas Pipeline Network Solution

Success Stories

China-Kazakhstan Gas Pipeline Project



Project Background

- Asian Gas Pipeline (AGP) is a joint venture of Chinese oil giant CNPC and Kazakhstan’s state-owned gas transportation company KazTransGas.
- AGP is responsible for organizing and implementing engineering, operation, and management for the Kazakh section of the Central Asia–China gas pipeline project.

Huawei Solution

- Used OSN 3500 and OSN 1500 devices for the 1833 kilometer optical communications network and deployed AR routers at the control center and block valve stations.
- Provided IP networking, SCADA, VSAT, VoIP and DC products.
- Delivered optical transmission communications products and services worth US\$60 million, 50 percent of the total project amount of US\$120 million.

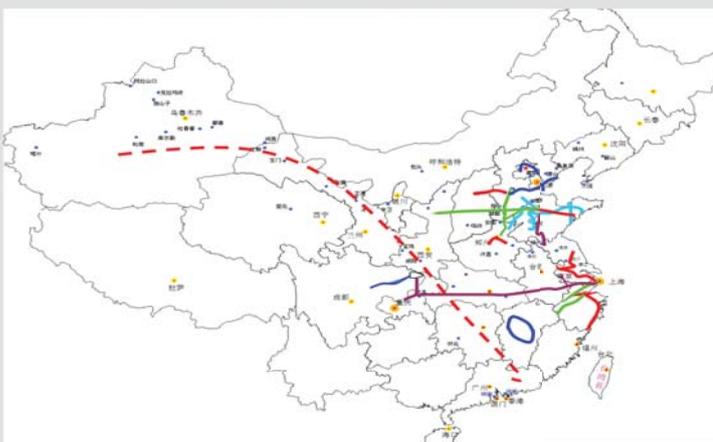
Customer Benefits

- Gas transport volume increased to 30 billion cubic meters per year, which easily supports China’s future energy strategy.
- Improved friendship between China and Kazakhstan



Success Stories

Pipeline Communications Network for Sinopec



Project Background

- Sinopec is China's largest petroleum refiner and oil products producer.
- Sinopec wanted to build a large-capacity and reliable optical transmission system to meet its future growth.
- This project covered the Sichuan–Shanghai gas pipeline, East China dispatch center, and Jiangsu oil product pipeline.

Huawei Solution

- Used OSN 7500, OSN 3500, and OSN 2500 products to achieve unified dispatch and uniform spare parts.
- Used SYNLOCK V3 to set up a time synchronization network for high-precision signal synchronization.
- Deployed a centralized NMS, consisting of two T2100s (network-level NMS) and 10 T2000s (subnet-level NMS) to achieve centralized management and differentiated rights- and domain-based management.

Customer Benefits

- A stable and reliable transport platform for Sinopec's SCADA, industrial TV monitoring and VoIP services
- End-to-end quick service provisioning
- Larger capacity and higher bandwidth to lay a cornerstone for future digital transformation

Oil and Gas Pipeline Network Solution

Success Stories

CNPC Lanzhou-Zhengzhou-Changsha Oil Product Pipeline Project

Project Background

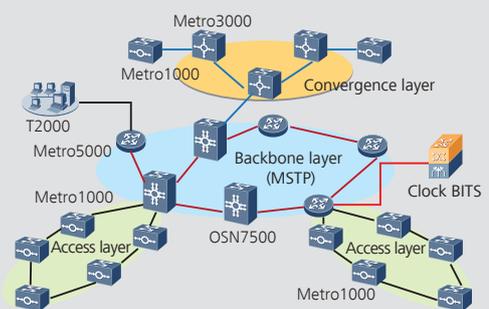
- This project involved a 2134.36 kilometer backbone line with 14 tributary lines.
- The customer required unified network management with the national dispatch and control center.

Huawei Solution

- Deployed Huawei MSTP equipment network-wide (networking: OSN 7500 + Metro 3000 + Metro 1000).
- Adopted the STM-16 (2.5 Gbit/s) transmission system for the backbone line and STM-1 (155 Mbit/s) for each tributary line.

Customer Benefits

- Support for future bandwidth-hungry services, such as HD video services
- Reliable service transmission with Digital Data Network (DDN) backup for important services such as Supervisory Control and Data Acquisition (SCADA)
- Integrated NMS for unified management and dispatch





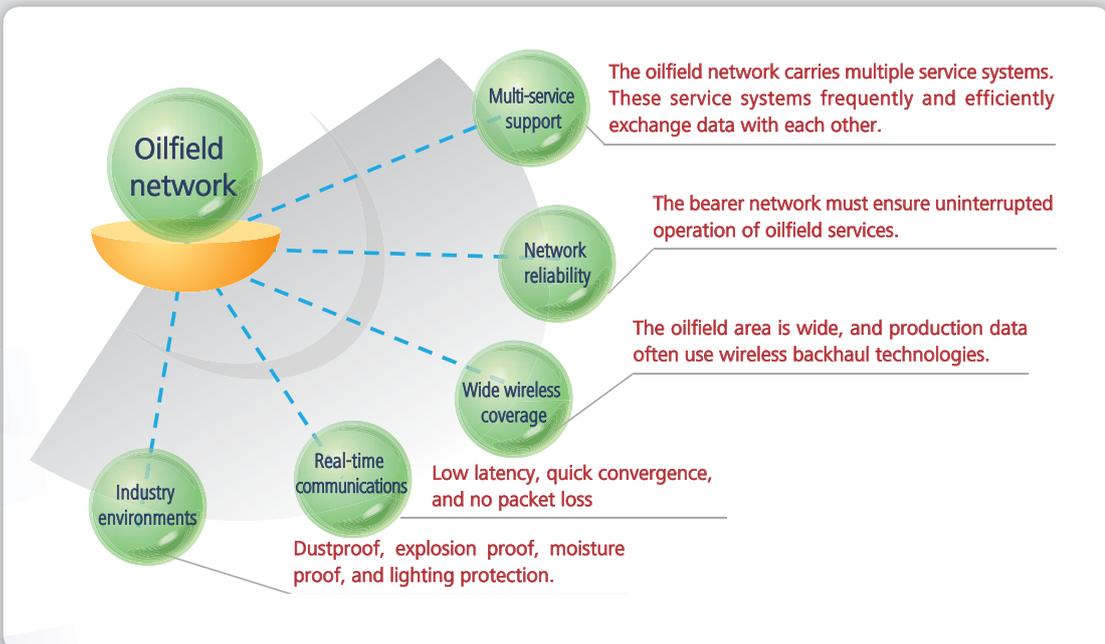
Oil and Gas Field Network Solution

Scenario Introduction

An oil or gas field network involves four parts: HQ, oil production plant central control room, the functional station (such as the processing station and metering station), and the operation area. The communications network for an oil or gas field carries two types of services:

- Production and control services, including services for control systems such as SCADA and Distributed Control Systems (DCS), as well as those for production dispatch and monitoring, such as dispatch telephony, industrial television and Manufacturing Execution Systems (MES).
- Office informatization services, including office automation (OA), voice conferencing, and administrative telephony.

The informatization of digital oilfields and the emergence of Internet of Things (IoT) are imposing higher requirements on the communications network.



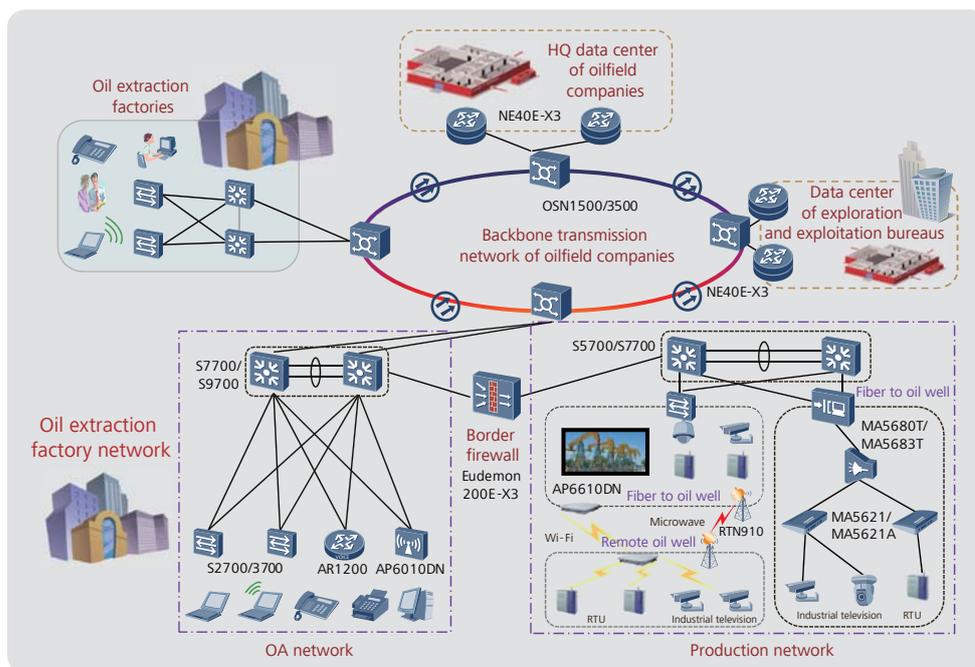
Oil and Gas Field Network Solution

Solution Overview

The Huawei oil and gas field network solution comprises three parts:

- **Backbone transmission network:** Consists of Huawei MSTP equipment and connects oilfield HQ and branch organizations such as oil production plants, exploration and exploitation companies, and research institutes.
- **Production network:** Uses Wi-Fi or microwave for production data backhaul from remote oil and gas wells; builds an optical network with Gigabit Passive Optical Networking (GPON) equipment and industrial switches for fiber to the well and at attended sites such as the central control room and processing stations; physically isolates production services (industrial television, SCADA, dispatch telephony, etc.) using access switches; deploys firewalls at the egress for security access to the office network, ensuring information security and service isolation.
- **Office Automation (OA) network:** Covering attended sites such as the central control room and processing station, using a hybrid network (AR G3 routers, indoor WLAN devices, S series switches, etc.) for an integrated office experience.

Typical Network Structure and Equipment



- Backbone transmission network: OSN1500/3500
- Production network: AP6510DN/6610DN, RTN910/950, industrial switch, MA5680T/5683T, MA5621/5621A
- Office network: AR2200/3200, NE40E-X3/X8, S2700/5700/9700, AP6010SN/6010DN/6310SN

Success Stories

Enterprise Network Project for Northwest Sichuan Gas Field, Southwest Oil and Gas Field Branch, CNPC

Project Background

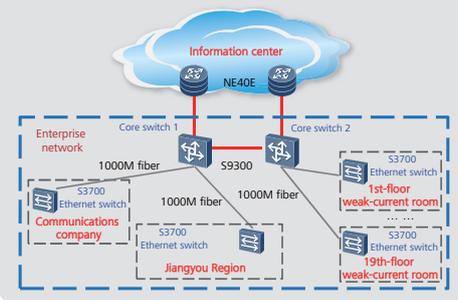
- Live network devices of the Northwest Sichuan Gas Field had failed to accommodate the service growth.
- To increase the network's level of information, the Northwest Sichuan Gas Field intended to build a new telecommunications room for core devices of the enterprise network and transmission network.

Huawei Solution

- Used two S9300s (core Ethernet switches) and two NE40Es (core routers for connecting the enterprise LAN to WAN) to serve as the core of a 10 GE office network.
- Deployed multiple S3700s for 100 Mbit/s desktop access.

Customer Benefits

- Superb routing, multi-service support, and multicast scalability capabilities provided by NE40Es, accommodating future bandwidth demands and protecting customer investment
- High-density (480 per S9300) 10 GE ports, helping enterprise campuses achieve non-blocking and all-10 GE switching



Oil and Gas Field Network Solution

Success Stories

Submarine Cable Access Project for Total Gabon



Project Background

- South Atlantic 3/West Africa Submarine Cable (SAT-3/WASC) was deployed, but there was no access point in Gabon for the submarine cable.
- Total Gabon had insufficient international network bandwidth, failing to meet service requirements.
- Carriers in Gabon provided limited access resources for international interfaces, and it was impossible for Total Gabon to lease such resources from carriers.

Huawei Solution

- Provided multiple sets of OSN3500s and U2000s and built a network for the customer to access SAT-3/WASC.
- Deployed a 36.5 kilometer transmission cable with four sets of ODF/DDF-involved devices in turnkey mode.

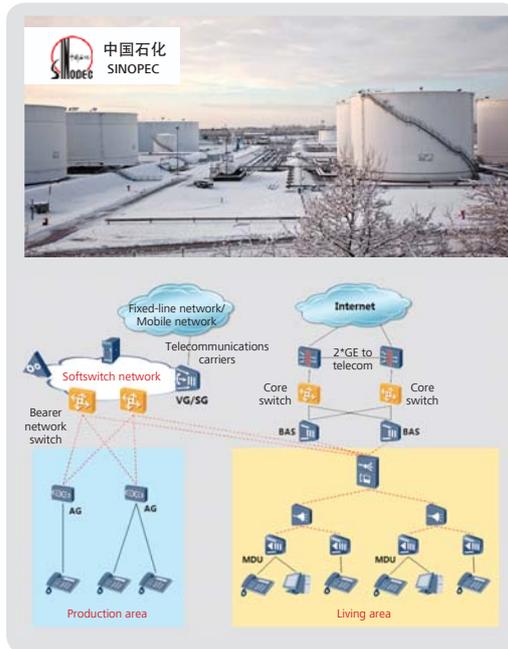
Customer Benefits

- Independent access to SAT-3/WASC bandwidth, meeting bandwidth requirements for different services
- Hybrid MSTP to support various services and ensure network reliability (50 ms protection for MSTP devices)

Refinery and Mining Network Solution

Success Stories

NGN Softswitch-based IP Bearer Network Project for Sinopec Anqing Company



Project Background

- The Information Center of Sinopec Anqing Company provided fixed phone services and broadband access services for its production area and living area.
- The Information Center intended to expand its service scope to 12,000 fixed phone users and 7,200 broadband access users, but the original network failed to meet these requirements.

Huawei Solution

- Employed carrier-class NGN to optimize voice services in the production and living areas and used PON for both broadband and narrowband service access in the living area.
- Built IP bearer networks with S9300 and X7 series switches for higher reliability and larger capacity.

Customer Benefits

- More secure and reliable switch operation due to carrier-class structure
- Reduced costs and fully leveraged internal network resources through an integrated communication platform for multimedia information (voice, video, and data)
- Enhanced user experience and higher profitability through abundant new service functions

Information Network Optimization Project for Shenhua Ningxia Coal Industry Group

Project Background

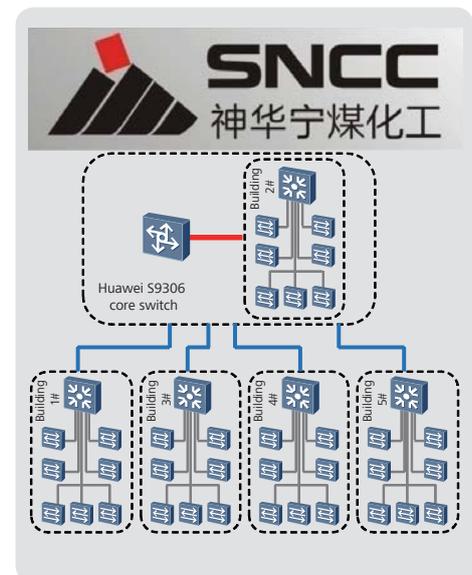
- Shenhua Ningxia Coal Industry Group divided its information network into an information intranet and information extranet. The information intranet and information extranet were physically isolated. The former provided support for major services (OA, finance, MIS, etc.) in the group, while the latter provided a portal system to carry production and office services. To meet increasing service requirements, the information network needed optimization.

Huawei Solution

- Used three-layer network structure for both the information intranet and information extranet.
- Deployed S9300 switches at the core layer and convergence layer, forming a 10 GE core network.
- Deployed S5300s (GE switches) at the access layer for GE-to-desktop.

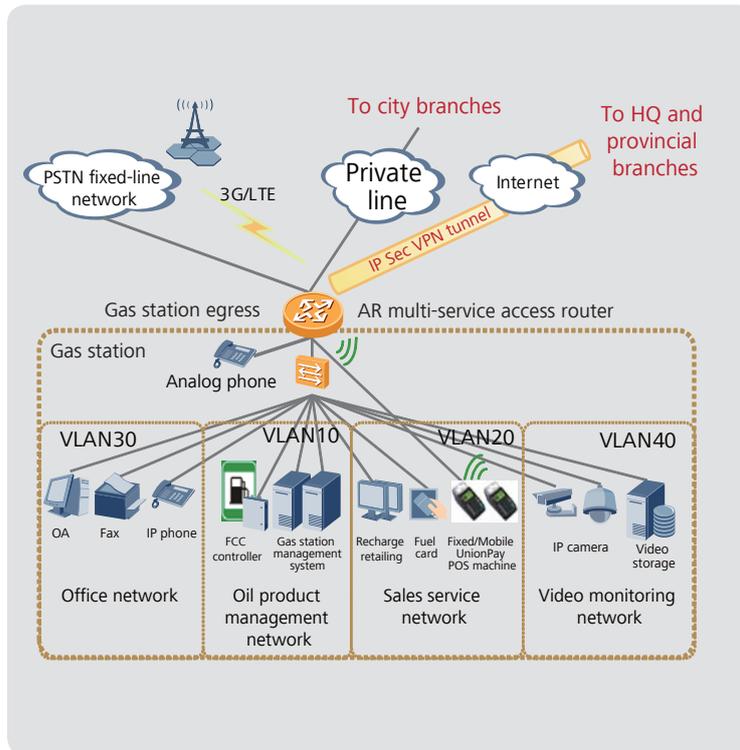
Customer Benefits

- Better network scalability for future service demands through the use of function-rich and cluster-structured S9300s
- Better network reliability and security owing to the secure protection measures of S9300s
- More environmentally friendly due to the energy conservation and emission reduction feature of Huawei all-series switches



Gas Station Network Solution

Scenario Introduction



Service Network Design

- OA network: OA, administrative IP/analog telephone, printing, and faxing
- Oil product management network: front-end controller, oil product management service, and back-end management server
- Sales service network: gas card payment terminal, Point of Sale (PoS) machine, and financial retail system
- Video surveillance network: digital camera and video storage equipment
- Four VLANs for separating office, oil product management, sales service, and video surveillance networks
- AR (multi-service access router) at the egress

Solution advantages

- Full-service support (with full-featured service access routers that integrate functions of firewalls, egress routers, WLAN APs, voice gateways, and switches)
- Cost-effective VoIP
- Dead-zone-free HD digital video surveillance



Success Stories

Gas Station Network Project for Sinopec Guangdong Oil Products Company

Project Background

- Sinopec Guangdong Oil Products Company planned to upgrade the bandwidth from 2 Mbit/s to 10 Mbit/s for OA, billing and surveillance services, but TP-Link routers at the egress of its live network failed to meet service expansion and enrichment requirements.

Huawei Solution

- Deployed 2,200 AR1200s to cover all gas stations throughout Guangdong province. The AR1220 uses a multicore processor and processes services in distributed mode. As a new generation service router with carrier-class reliability, the AR1220 router has powerful service processing and 450 kpps forwarding capabilities, integrating multiple functions such as data, voice, routing, security, switching, and VPN through its abundant interfaces.

Customer Benefits

- Well suitable for customer demands and support for future service expansion

