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HUAWEI ENTERPRISE **A BETTER WAY**

HUAWEI

Preface

As worldwide energy demand increases in the face of shrinking oil and gas reserves, oil and gas companies face increased production costs. Information communication technology (ICT) can help reduce these costs. ICT can streamline the management process, improve communication efficiency, and decrease production costs. By combining ICT with traditional oil and gas production technologies, companies minimize the risks in developing oil and gas, while achieving safe and efficient operation.

As a leading global information and communication solutions supplier, Huawei has gained rich experience in the ICT field. We devote our efforts to providing comprehensive and high-efficiency ICT solutions for governments and enterprises in the energy, finance, traffic, and power industries across the world. We have invested a great deal of time and effort in the oil and gas field and have launched a digital pipeline production solution that facilitates remote management and control, improves operating efficiency, and reduces operating expense (OPEX).

Huawei digital pipeline solution provides complete and reliable coverage, and a highly integrated communication platform. The solution includes an intelligent security platform for oil and gas pipelines and the sites deployed along the pipelines. The solution enables oil and gas companies to keep track of pipeline operations and greatly enhance pipeline security through automated warnings and rapid response to incidents. These capabilities facilitate remote pipeline management and control, reduction of OPEX, and improved production efficiency.

Challenges Confronting Oil and Gas Pipeline Operations

Pipelines provide cost-effective transportation, delivery of accurate oil and gas quantities, and low transportation loss.

At the same time, pipeline engineering is complex, and pipelines must cross long stretches of challenging terrain. Manual pipeline management covers only the main sites along pipelines and imposes a heavy workload, low efficiency, and high labor costs. Oil and gas pipelines typically rely on conventional scheduling, conferencing, and telephone systems that are independent of each other. The systems have to be maintained at high cost but have low communication and decision-making efficiency. These issues only add to the traditional challenges of pipeline wear and tear due to corrosion, harsh environments and disasters, as well as theft and vandalism.

Today's ICT capabilities offer effective technical solutions that enable oil and gas companies to address these challenges. More and more oil and gas companies have turned to information and communication technologies as key strategies for remote pipeline management and efficient pipeline operation. By using ICT, management personnel easily keep track of pipeline operating status and implement workable maintenance plans, preventing accidents and strengthening pipeline security.

Huawei digital pipeline solution is based on ICT capabilities and meets oil and gas companies' requirements for production data transmission, voice and video communication, and emergency scheduling.

Huawei Digital Pipeline Solution

By devoting our efforts to analyzing the communication requirements for long-distance pipeline transportation, Huawei has launched the digital pipeline solution shown in Figure 1. This solution covers a infrastructure network, convergence communication, and integrated security. The solution applies a variety of communication measures to provide a reliable and unified office communication platform and intelligent security surveillance system for the sites deployed along long-distance oil and gas pipelines. With the ability to meet challenges from harsh environments, the solution helps overcome operating and maintenance (O&M) difficulties. By working with a supervisory control and data acquisition (SCADA) system, the solution helps companies master the pipeline operating status in real time for ease of risk response and improved efficiency.

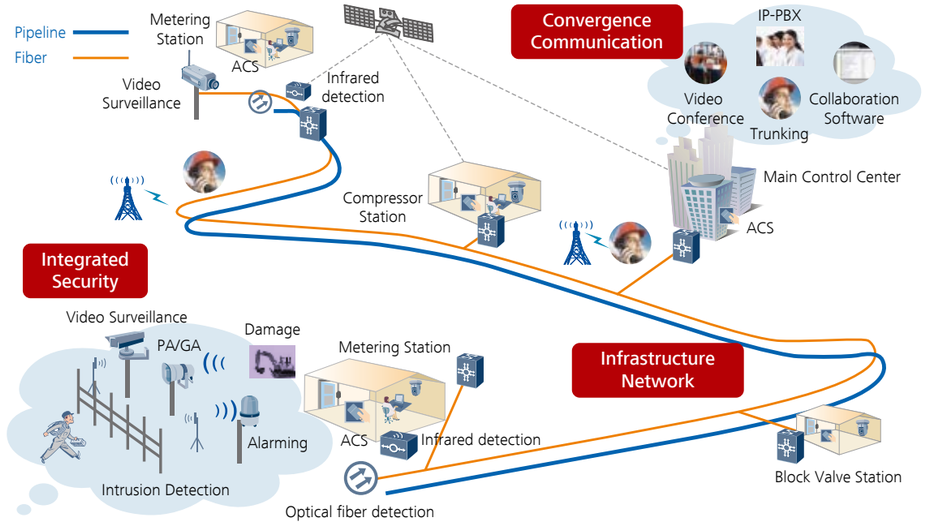

Figure 1 Huawei digital pipeline solution

Huawei digital pipeline solution has the following features:

- **High reliability**
  The solution's infrastructure network uses optical fibers and microwave to transmit data, covering all the sites along pipelines. The solution ensures reliable service transmission using a variety of methods, including satellite communication as a backup link to protect the entire network from going down due to any single-point failure.

- **Seamless convergence of multiple office communication systems**
  The solution enables independent office communication systems to converge and supports scheduling and trunking. Using multiple types of terminals, the solution enables conferencing and communication at anytime, anywhere.

- **Effective risk response**
  By using systems and technologies such as intelligent surveillance, SCADA, intrusion detection, and door access control, the digital pipeline solution helps oil and gas companies keep track of real-time pipeline operating status and environments. The solution also analyzes incidents intelligently and responds to risks rapidly to ensure pipeline security.

Digital Pipeline Infrastructure Network Solution

Automation is proving increasingly useful for oil and gas pipeline operation, so the infrastructure network has to carry ever greater numbers of communication services. Production services such as SCADA, video surveillance, and scheduling services demand real-time capability and high reliability. On the other hand, management services such as office automation (OA) and video conference tend to involve high volumes of "bursty" traffic. Supporting all types of traffic requires versatile networking solutions.

- **Application Scenario**
  The infrastructure network is deployed along pipelines, connecting main control center, metering stations, pumping stations, compressor stations, and block valve stations that require communication in wireless and wired modes.
- **Overview**
  Huawei digital pipeline infrastructure network solution uses optical fibers as the main transmission media. In other areas difficult to reach with optical fibers, microwave transmission is used. A very small aperture terminal (VSAT) satellite communications system provides backup links for the main control center, metering stations, pumping stations, and compressor stations. If fiber transmission is disrupted, the SCADA and hotline services switch to the VSAT system. Figure 2 shows the digital pipeline infrastructure network solution.

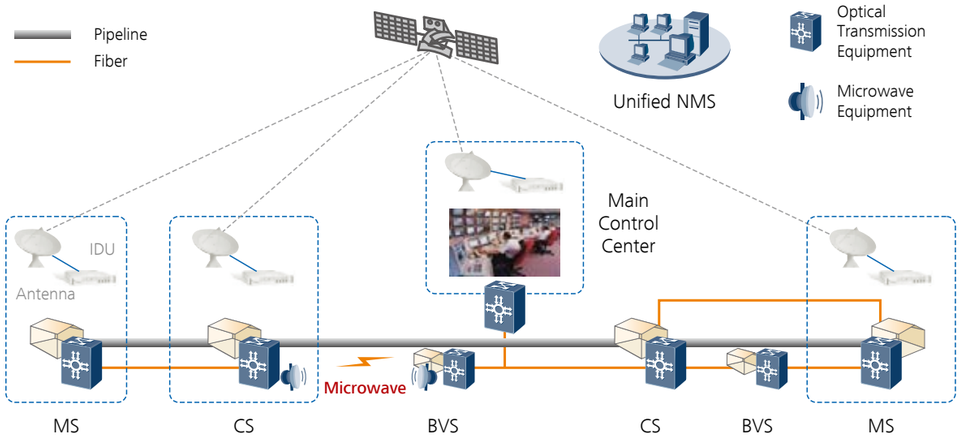

Figure 2 Digital pipeline backbone network solution

- **Benefits**
  - Services switch to backup links within 50 ms, ensuring service reliability.
  - The optical network uses a chain or ring network topology, which helps prevent single-point failures from disabling the entire network.
  - Both fiber and microwave transmission are employed for seamless coverage, which maximizes the return on investment (ROI) and simplifies operation and maintenance.
  - Pipeline data transmission can seamlessly switch between fiber and satellite communication to ensure 24/7 communication in any weather conditions.

Digital Pipeline Convergence Communication Solution

Traditional communications systems for video conferencing, dispatcher communications, and calls are built separately and provided by different manufacturers. These systems are not usually highly compatible with each other, which increases their bandwidth demands and maintenance costs, especially when they are expanded to meet new service requirements. Huawei digital pipeline convergence communication solution integrates these communications systems with a management platform. The solution supports communication among multiple types of terminals and the digital trunking service. The solution allows offices and terminals to share information in real time, anytime, anywhere.

- **Application Scenario**
  Huawei digital pipeline convergence communication solution applies to main control center, metering stations, pumping stations, compressor stations, block valve stations where voice, video, and data services are needed. The solution also suits outdoor production areas that require unified scheduling over voice services.
- **Overview**
  Huawei convergence communication solution integrates IP FAX, video conference, telephone, trunking services, and so on, achieving efficient and low cost communication on one platform. And it allows access from a variety of terminals, including analog phones, IP phones, video phones, software clients, PCs, Wireless Fidelity Alliance (WiFi) phones, and trunking phones. Huawei convergence communication solution is open, efficient and convenient, helping enterprises to simplify the communication way, improve communication efficiency and bring about a new communication experience.
    - **Figure 3 shows a multiterminal convergence conference system.**

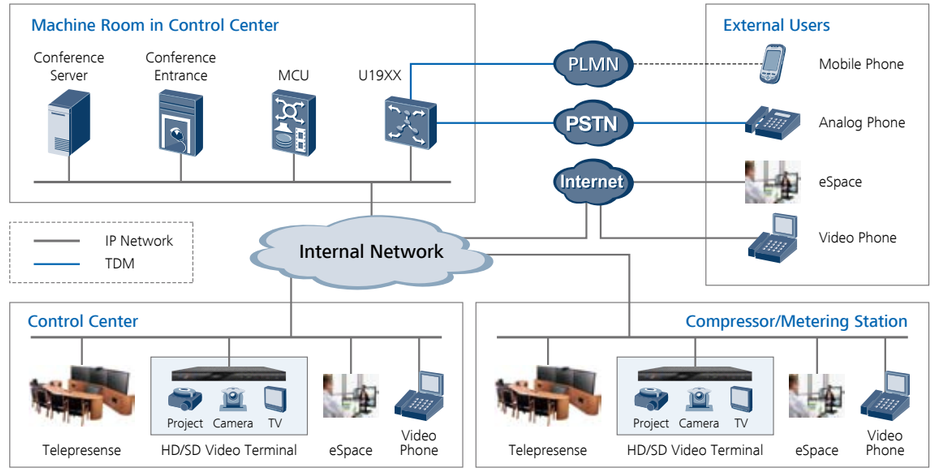

Figure 3 Multiterminal convergence conference system

Convergence conference terminals include intelligent systems, high definition (HD) or standard definition (SD) video terminals, video phones, IP phones, analog phones, and mobile phones. The convergence conference system carries voice, video, and data services and offers manageability and security features.

An all-in-one voice service system facilitates the convergence of wireless transmission and wired transmission, as well as convergence of administration and scheduling, and analog and IP phones.

- Figure 4 shows an all-in-one voice service system.

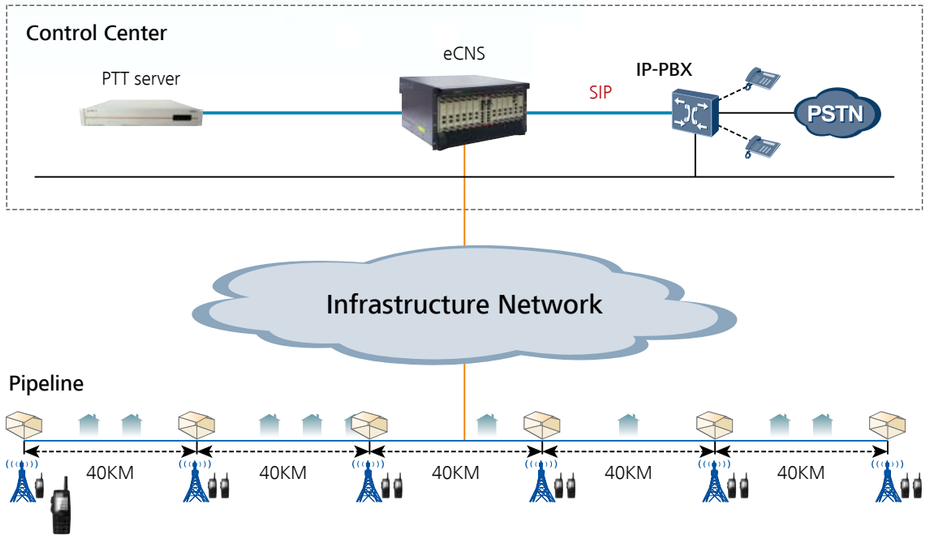

Figure 4 All-in-one voice service system

As shown in Figure 4, the private branch exchange (PBX) interworks with the public switched telephone network (PSTN). The enterprise core network system (eCNS) of the LTE-based enterprise wireless broadband (eWBB) network interworks with the PBX over the Session Initiation Protocol (SIP). Baseband units (BBUs) and remote radio units (RRUs) are deployed along pipelines to achieve overall digital trunking coverage. Waterproof, dustproof, and flameproof terminals are employed to support scheduling and negotiation during preventive maintenance, troubleshooting, and emergencies.

- **Benefits**
  - Open architecture via IP, fully compatible with existing communication systems, which maximizes ROI.
  - Push-to-talk (PTT) phones, analog phones, and IP phones can communicate with each other.
  - The digital trunking system covers all pipelines, and all communication links are encrypted in end-to-end (E2E) mode.
  - Multimedia broadband trunking via LTE, not only voice but also data and video services are supported, and video can be captured and sent during preventive maintenance.

Digital Pipeline Integrated Security Solution

The long-distance oil and gas transportation system is an integrated, large-scale system consisting of pipelines, tank fields, pump houses, valve banks, monitoring meters, and control devices. Ensuring pipeline security and stability by relying only on manual preventive maintenance is a major challenge. The threat of harm multiplies the difficulty. A reliable integrated security system can help.

- **Application Scenario**
  Huawei digital pipeline integrated security solution employs an intelligent video surveillance system (IVS) to monitor the main control centers, pumping stations, compressor stations, metering stations, valve stations, and areas along pipelines in real time.

- **Overview**
  The integrated security system consists of an intelligent video surveillance (IVS) system, SCADA system, intrusion detection system (IDS), access control system, and other types of security and monitoring systems. These systems combine to monitor physical security and detect leaks alongside pipelines and at stations. Surveillance images are collected by surveillance devices like IP cameras located alongside pipelines. These images are saved in a local disk array or sent to and saved in a disk array at the control center. Using application systems and management systems, images can be pulled up, browsed, replayed, and managed to facilitate emergency response and problem tracking. The IVS allows alarm linkage with the SCADA system and the IDS. In addition, the IVS works with the GIS to locate and browse over surveillance sites. Figure 5 shows the digital pipeline integrated security solution.

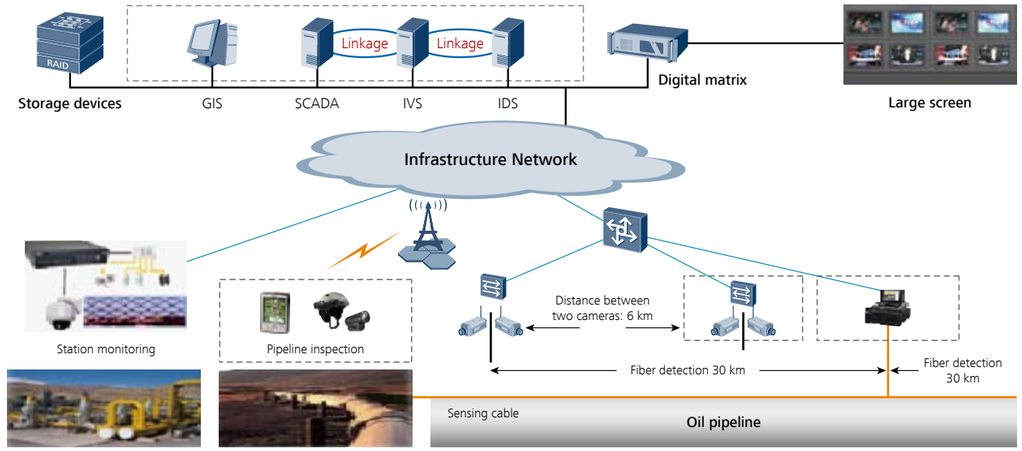

Figure 5 Digital pipeline integrated security solution

- **Benefits**
  - The devices work 24 hours a day, 7 days a week and have low error rates, ensuring high reliability.
  - Comprehensive monitoring, and the alarm generation and automatic detection functions provide a high level of security.
  - The IP network carries all services and provides a flexible and open architecture.
  - Warning and visualized management ensure easy operation.
  - Sites are monitored in real time, and risks are responded to rapidly.

Huawei digital pipeline solution uses multiple communication and information technologies to help oil and gas companies handle the wide variety of tasks required to keep oil and gas transportation running smoothly under all conditions. Toward this goal, the solution enables users to transmit information reliably in real time, improving collaboration and decision-making, significantly decreasing labor and capital costs, and ensuring pipeline operation security.

Application Case

Huawei Delivered Digital Pipeline Solution for Kazakhstan-China Gas Pipeline

The Central Asia gas pipeline — the longest in the world — stretches 2000 kilometers across central Asia from Huorguosi in Xinjiang, China, through Kazakhstan and Uzbekistan, and finally to Turkmenistan. The pipeline passes over mountains and through the Gobi Desert. The Kazakhstan-China gas pipeline is an important part of Central Asia gas pipeline, which addresses energy needs in central Asia and contributes to the economic development of the region.

The builder of the pipeline had to deal with challenging terrain, harsh environments, low-quality infrastructure, and complex security requirements. The builder needed reliable communications coverage for all the sites along the pipeline and multiple access methods for convenient communication, as well as efficient data analysis. Additionally, the builder required a security system that could detect all threats and respond in real time. An intelligent integration security system meets this need.

Huawei supported the builders massive efforts with an E2E ICT solution that consists of an fiber transmission system, telephone system, video surveillance system, wireless trunking system, video conference system, and shortwave wireless system. These networks and systems offer unified coverage, overall sensing, convergence communication, easy operation, integration security, and multi-level protection.

Huawei provided an IP-based basic network solution comprising an optical network, a microwave network, and a satellite system. Huawei laid out optical cables along the pipeline to construct an optical transmission system. In areas where optical cables were difficult to lay, Huawei used microwave links. For main control centers, metering stations, pumping stations, and compressors stations, both optical cables and satellite links were deployed. If the optical cables fail, services such as SCADA and emergency calls in the stations switch to the satellite links to ensure normal running.

For production communication, Huawei provided a solution that integrates IP voice services, a wireless trunking, and HD video conferencing. The solution uses IP-PBXs, video conferencing systems, and office cooperation software to support routine office services. The trunking communication system supports scheduling to ensure convenient and high-quality communication.

For security, Huawei deployed IVS and SCADA systems along the pipeline, allowing users to track site information and production data in real time. In key areas, Huawei installed IDSs and ACSs which work with IVSs to generate alarms and ensure pipeline security.

With the Huawei digital gas pipeline solution in place, users can manage and control the entire pipeline. The combination of transmission methods ensures seamless coverage and convenient access.

Zhong Fan, the general manager and chief representative of Asian Gas Pipeline (AGP), praised the project, noting that "Huawei and its whole project team devoted much effort to delivering the Kazakhstan-China gas pipeline project and did a good job."