

# PONTI RADIO PR - CASE STUDY: RADIO-CONTROLLED SCADA SYSTEMS FOR AN OIL PIPELINE

CUSTOMER: IG O&M S.P.A.



**IG Operation and Maintenance S.p.A.** provides O&M services for an oil pipeline with a 180 km extension over hills.

The pipeline was controlled by a telemetry system based on UHF radio links equipped with low-speed FSK modems.

The modernization of the SCADA systems, needed to suit the up-to-date quality and efficiency standards, required the following activities:

- A remake of the Dispatching Center
- Implementing additional valves and additional pumping stations
- Substituting the remote-control out-stations for the pumping stations
- Implementing a leak-detection system (which required intermediate telemetry points)
- Implementing an additional control system for fiscal data
- A remake of the whole telecommunication system among the Dispatching Center, the pumping stations and the telemetry points distributed along the oil pipeline's layout



IG Operation and Maintenance S.p.A. was in charge of developing all that was needed for the modernization of the oil pipeline - it hence created a project team with highly-specialized professionals. **Ponti Radio PR**, which has been managing the O&M services of the radio network for the monitoring of the pipeline for over 10 years, was engaged in developing the main telecommunication system.



# THE CHALLENGE

Designing the telecommunication system was part of the larger project aiming at fully modernize the telemetry/SCADA and remote control management systems for the oil pipeline.

A new radio network was needed for the following **reasons**:

- the equipment of the radio network was technologically obsolete
- the radio links' network had to be extended to reach the additional telemetry points
- the throughput of the network had to be increased to support the new services
- the overall availability of the telecommunication system had to be increased

The project was set upon the following **requirements**:

- implementing a two-way network: one with a proprietary radio network, the other using link on the public fixed network, in order to satisfy the security and availability requirements of the data transmission
- migration from the analog technology to a state-of-the-art digital technology, capable of supporting IP links
- researching a wireless solution with high performance, low latency, high spectral efficiency, easy implementation; it had to support high over-IP SCADA traffic volumes and a high number of out-stations distributed over long distances and inconvenient locations
- keeping the existing radio towers (some of them were property of the Client), in order to minimize the lease costs for equipment housing
- using the same UHF frequency range, to set up longer links
- maximizing the usage of the existing antennas, in order to minimize the substitution costs and the costs related to new permits and authorizations
- optimizing the implementation, delivery and commissioning of the telecommunication system
- efficiently managing a soft migration from the existing system to the new one, in order to guarantee service continuity with no interruption

# THE SOLUTION

**Ponti Radio PR, in collaboration with IG O&M and coordinating with the other project's teams, developed the preliminary design and the definitive and executive project for the telecommunication system.**

The chosen network architecture considers, for each terminal station, the creation of a two-way link: a radio link guaranteeing stability and reliability, and a MPLS connection built over the network of a public Operator, being more convenient and easy to deploy.

A **MiMoMax Point to Point and Point to Multipoint Digital Link (NDL e MDL)** platform was chosen for the "radio link" specifications of the network, while the "cable" specifications of the network were achieved with a MPLS solution based on the fixed network of one of the main TLC Operators in Italy.

The MDL (point-to-multipoint) platform is made by a **Base Radio Unit - BRU-** and by some **Remote Radio Units -RRUs-** whose number is variable to the specific needs of the Client. The BRUs transmit data to the RRUs using a highly-efficient random access protocol.

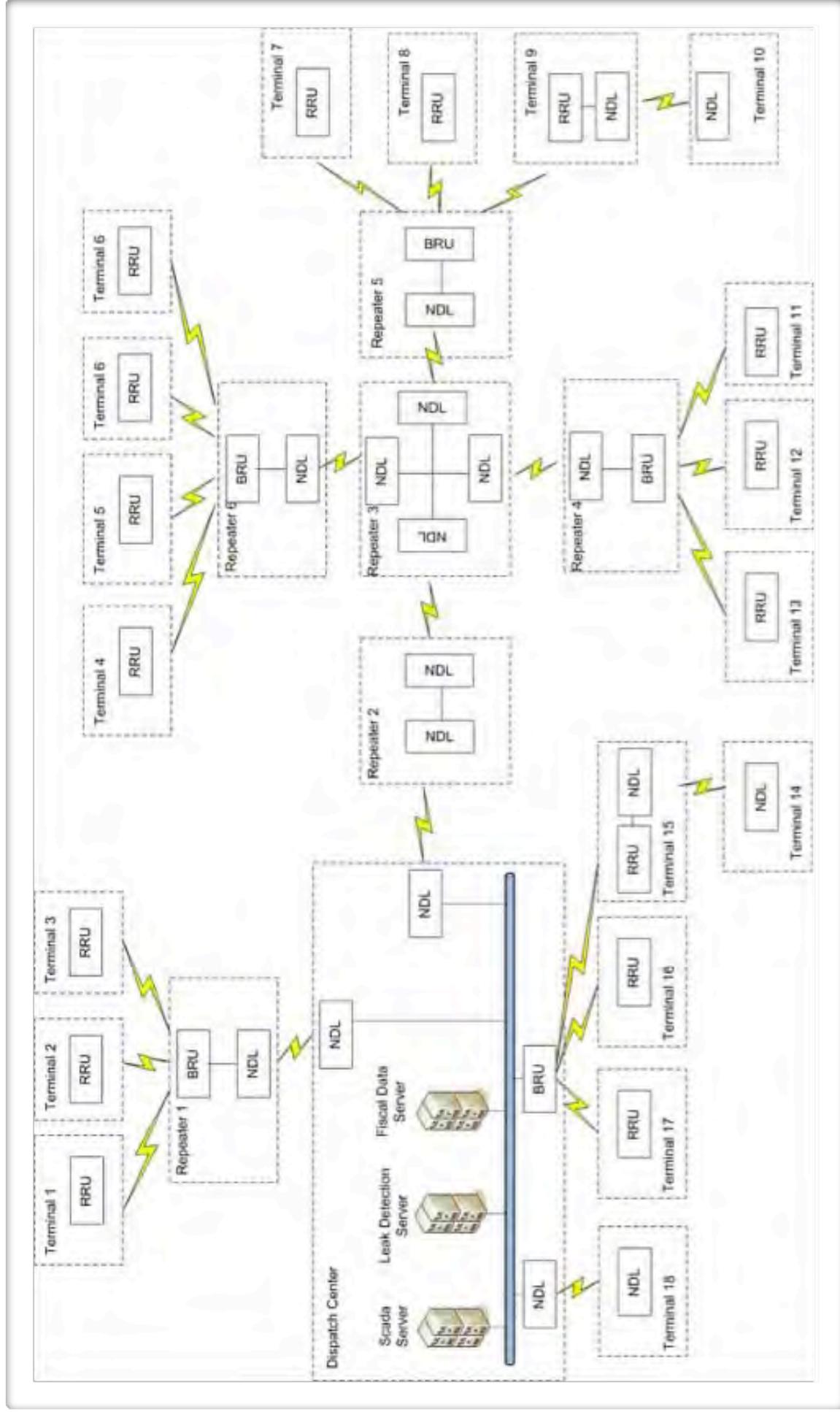
The selected radio platform is the most effective in the industry in terms of spectral efficiency, guaranteeing IP connection with a throughput up to **320 Kbps** on a **25 KHz** channel in **UHF** frequency range.

The UHF frequency range enables long-distance links (the longest link is 45 km) and it is basically immune to fading phenomena related to bad weather conditions: it hence maximizes the system's overall reliability.

The network architecture is based upon a backbone with point-to-point **MiMoMax NDL** links developing in 4 main directions and leveraging 6 repeaters, together with a series of point-multipoint **MiMoMax MDL** to serve 18 terminal stations.

Those stations not reachable through the point-to-multipoint systems are connected via additional point-to-point links starting from the existing pumping stations

# NETWORK ARCHITECTURE



# BENEFITS

The high flexibility of the MiMoMax platform mixed to the system integration skills of Ponti Radio PR allowed IG O&M to achieve the following technical benefits:

## **High reliability of the links and real-time monitoring and troubleshooting**

The whole radio network is constantly monitored by a SNMP server which periodically checks all the network's equipment, detects any possible malfunctioning, allows a first-level intervention with a remote check-up and supports the technicians in their on-site trouble-diagnosis and troubleshooting.

## **Full control of the oil pipeline's functioning parameters**

The increased transmission capacity allows each subsystem to operate at full capacity with no limitations due to the available bandwidth

## **A low-cost solution**

Ponti Radio PR's well-established experience in the implementation and maintenance of mobile radio networks and the deep care applied to RF planning resulted in the following achievements:

- Base Radio Units were positioned in the existing radio towers, and even the new telemetry points were linked from the same towers, minimizing the number of needed BRUs
- 100% of the existing antennas were re-used
- hence, few new permits and authorizations were needed
- 100% satisfaction of all the needs in terms of speed and standards set by the teams who developed the telemetry, remote control and supervision services
- equipment was implemented with energy back-up systems, guaranteeing the communications even in case of power losses
- the migration process was efficiently optimized by temporarily using the MPLS network and by planning the radio links substitution together with the equipment substitution in the radio towers.

# RESULTS

The executive project prepared by Ponti Radio PR will enable the deployment of an effective management system for the oil pipeline, thanks to a highly-reliable radio network with the best spectral efficiency, and with a high throughput, capable of supporting each SCADA system.

The high complexity of the project and the coordination of the 3 project teams required a strong binding relation between IG O&M and Ponti Radio PR - they have been strictly collaborating along the whole design process.

The flexibility of the commercial approach and the high technical and professional skills showed by Ponti Radio PR in the design phase convinced IG O&M to further commit to Ponti Radio PR the turn-key installation and commissioning of the whole radio network.

**The deployment of the whole system is expected to be achieved in 2 phases: the first phase is related to the connection of the existing pump units and the existing valves and will be completed in 2015; the second is related to the new telemetry points, and will be completed in 2016.**





**IG O&M S.p.A.** is a company established on January 1st 2013 as a spin-off of the Company Infrastrutture e Gestioni S.p.A., with a business focus on **Operation & Maintenance services applied to industrial plants located in national and international contexts.**

IG O&M provides Operation and Maintenance high level services tailored for critical sectors such as O&G, Energy and Aviation.

IG O&M can elaborate engineering maintenance programs starting from detailed Audits and Assessment for the BOP Balance of Plant including energy, process, environment and safety

The Company staff includes a dedicated group of maintenance engineers (TCA's) able to develop specific programs of intervention, such as corrective, preventive and evolutive programs, through the expansion and the upgrading of Plants.

IG O&M has undertaken a series of important initiatives abroad, with a particular focus in North Africa through local Service Companies.

IG O&M currently has a staff composed by more than of 300 employees distributed in different Headquarters/Operating Units located throughout the national territory and in particular international contexts (Libya – Algeria).



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#### **Ponti Radio PR is an Italian System Integrator specialized in Private Radio Networks.**

Founded in 1962, it established its key role in the Oil and Gas market providing turn-key assistance on radio link used by SNAM for radiomobile communication and SCADA telemetry. The product portfolio of Ponti Radio PR includes:

##### **Engineering:**

- System Integration
- RF Planning
- Structural Engineering Assessment
- SW Development
- Assistance in Regulatory Matters

##### **Site Rental**

Over 100 towers in Italian strategic locations

##### **Installation and Commissioning**

Towers, Shelters, Antenna and Equipment

##### **Network Management Services**

##### **Maintenance**

- Call Center and Help Desk 24/7
- Trouble Ticketing
- On-site maintenance
- Spare parts management
- Repair Service

Ponti Radio PR has 15 branch offices to serve the whole Italian territory with high-quality SLA, with a central coordination.



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