



Transmission is reliable and safe when antennas are managed by Movicon

Simetel Spa and Sigma Consulting have engineered an interesting supervision system for monitoring and security of the NATO VLF transceiver station on the island of Tavolara

Simetel Spa has been operating in the professional and military telecommunications since 1959. It specializes in providing turnkey and tailor-made solutions of all dimensions that consist of integrating and design engineering telecommunication and safety systems correlated with post-installation maintenance. Within the context of a contract dealing with large projects, Simetel Spa was commissioned to design engineer a local digital communication network in the VLF radio station transmitter on the island of Tavolara. This involved creating a connection to some of the station's key functions for data transferral:

- Radio frequency emission monitoring system
- Antenna location security system

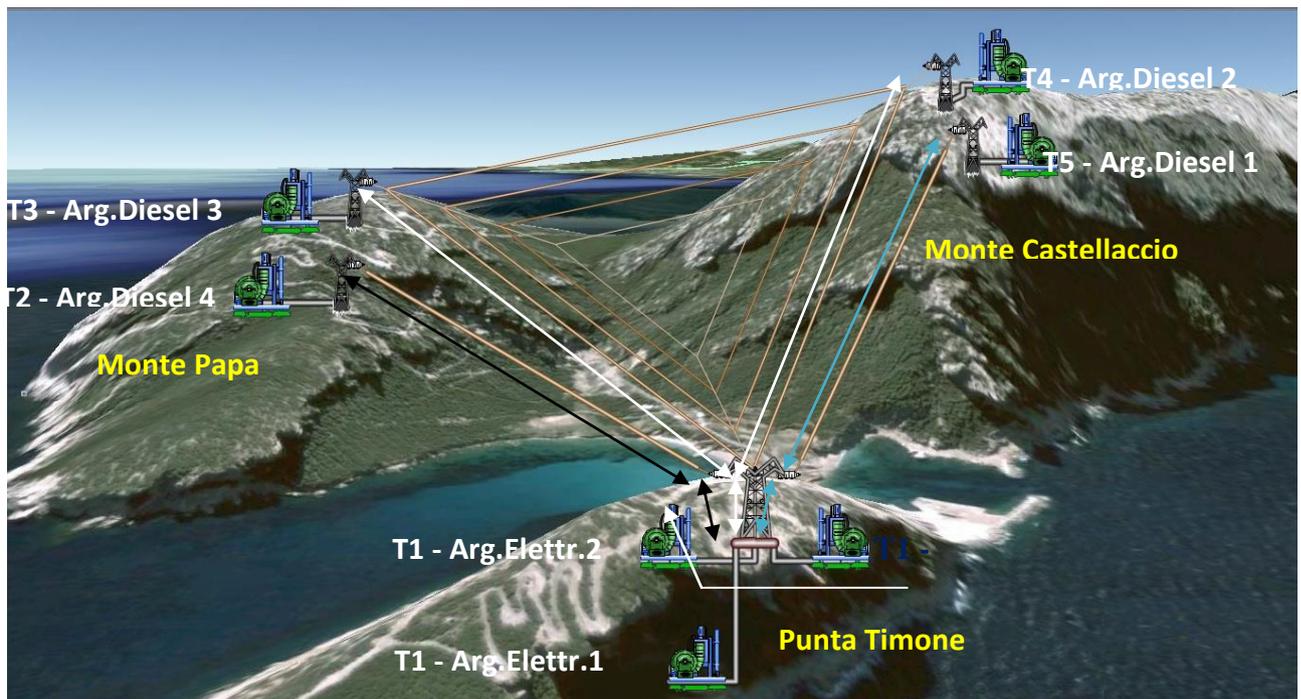
The VLF (Very Low Frequency) transmission technology uses radio frequencies in the range of 3 to 30 kHz, which correspond to wavelengths from 10 to 100 kilometers. This acronym represents one of the radio bands defined by the ITU-R, one of the three sectors of the International Telecommunication Union (ITU) which is an international organization responsible for radio communications. Their task is to manage the international spectrum of radio frequency and satellite orbit resources and to develop standards for radio communication systems to ensure efficient use of the electromagnetic spectrum.

The moment an appropriate band width is not available for radar signals transmitted with these frequencies, the VLF steps in to transmit simple information such as used in radio navigation. This band is also known as

myriametre band or myriametre wave which is an obsolete metric unit equal to 10 kilometers. This type of radio wave can penetrate water up to a depth of 10 to 40 meters depending on the salinity of the water. It is for this reason that the VLF wavebands are used for communicating with submarines near the surface, while deeply submerged vessels use the ELF (Extremely low frequency) radio wavebands which extend further at a frequency ranging from 3 to 30 Hz, which corresponds to wavelengths ranging from 10,000 to 100,000 km. The VLF is also used for electromagnetic and geophysical surveys.

ANTENNA POSITION SECURITY SYSTEM DESCRIPTION

Below the antenna position security system is described in detail. The software used for this system was commissioned by Simetel to Sigma Consulting, an engineering company with over 15 years of experience in Design Engineering and Integration of electronic and computer systems. Sigma Consulting chose the Movicon 11 Scada/HMI platform technology for its powerful but simple-to-use features and reliability that best suited their objectives and project purposes. Due to the location impenetrability, a redundant laser link system was chosen as a communication network transmission support to be used and powered by photovoltaic panels to be used in the event of power cuts. The network's capacity also enables implementation of future systems.



ELECTRIC WINCHES AND DIESEL WINCHES CORRELATION

The Tavolara VLF antenna is a steel lattice steel tower with four triangular cross-sections and two lateral conductors supported by five guyed steel masts, erected in relation to the tower's vertex points on three mountain ranges known as Punta

Timone, Monte Castellaccio and Monte Papa.

To give an idea of their sizes the longest conductors are more than 1000m in length. The tower can be raised or lowered using rope (halyard) systems and pulleys operated by motorized winches.

The halyards are connected to the triangular structure's vertexes and to the ends of the

tower's external side conductors using insulators.

The other end of the halyards are wound around and fixed to the corresponding winch spool.

The tower is lowered and raised by winches powered by diesel engines and electrical motors which are controlled locally and by remote control at a distance.

There are three winches powered by electrical motors at Punta Timone, two winches powered by diesel engines at Monte Papa and two winches powered by diesel engines at Monte Castellaccio.

The tower is usually raised and lowered on location manually for maintenance requirements.

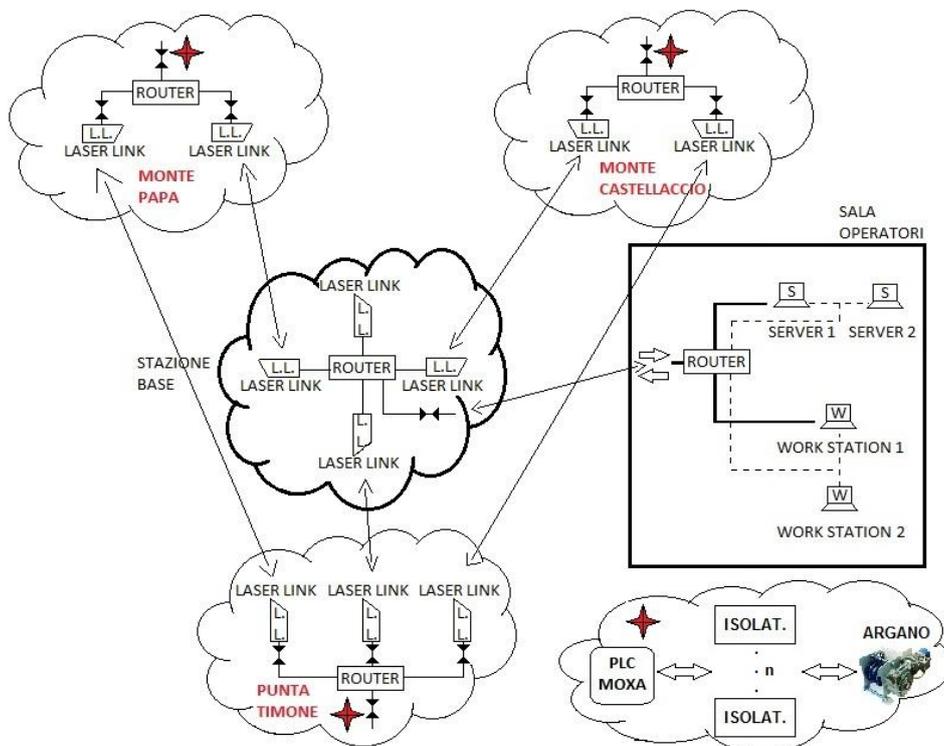
To obtain maximum antenna performance, the tower must be kept extended to maximum height. The tower is lowered to a safer height when at risk in the event of strong winds.

This is done by using the diesel powered winches hinged to a base on the ground which is raised and lowered when the tower is subjected to strong winds. When reaching a pre-calibrated critical height the security system intervenes to control the electric

winches to lower the tower. The maneuvers to reposition the Tower can only be performed manually either locally or by remote control. The actual halyard maneuver, both for the lowering and raising phase, is not performed in one single process but is divided in a cycle of movements defined in the software settings panel which can be accessed by System Administrators only.

THE ARCHITECTURE DESCRIPTION AND ADVANTAGES OBTAINED

The "SW-VLF-TAVOLARA" software has been designed and created within the Movicon 11 HMI-Scada environment for controlling and monitoring the VLF Antenna System. System monitoring and controlling takes place via an Ethernet connection system with routers located onsite of each antenna and in the control room. These are all connected to one another using a local laser communication system (RETE LASER LINK). The diagram below shows the system architecture and network which connects the various stations to the central control station.



The software installed in the workstation situated in the VLF station control room, controls and monitors the entire antenna system 24/7 by performing actions and receiving signals relating to the working status of the winches and all the other connected hardware systems.

The software interacts with the VLF antenna in the following modes:



- Sending commands to the winches:
 - Lower
 - Higher
 - Lock (Security)
 -
- Receiving signals of:
 - Alarm status of the winches
 - Operational alerts relating to connected winches.
 - Operational alerts relating to connected hardware systems

The software framework is based on a simple user interface structure powered by Movicon which provides the main screens (defined 'panels' have been designed for grouping features and data representations appropriately together using 3D background map layout graphics overlapped with dynamic objects provided within the Movicon environment.

The necessary features that have been implemented to satisfy user requirements for managing and monitoring the VLF Antenna system are:

- Login Panel
- Main Supervision Panel (Home)
- Alarm Panel
- System Check Panel
- Log Panel
- Settings Panel
- Menu Panel

LOGIN PANEL

Used by the user to log in and access the software features and functions.

MAIN SUPERVISION PANEL (HOME)

This is used for managing and monitoring the entire Antenna System. This panel displays the working status of all the components involved.

This panel has been designed in detail on the



reconstruction of the entire VLF system and includes all the controls and indicators previously used by the old systems composed of cabinets and within in the towers that still exist and function on the winch sites.

SYSTEM MONITORING AND CONTROL PANEL

This is used for controlling the SW-VLF-TAVOLARA Software connection status with the hardware devices and PLCs (Moxa) to enable connection to the winches which are connected to the Antenna System.

recorded in the system (Audit trail) so that they can be traced whenever needed.

ALARM PANEL

The operator uses this panel for viewing all the active alarms in the VLF system. The alarms are grouped by the area to which they belong to, principally defined by the various workstations that constitute the system. This panel displays general alarm information and a logical detailed assessment to enable appropriate user interaction within each alarm area.

HISTORICALS PANEL

All event occurrences and actions performed within the software are traceable with the Data Logger. It is of great importance that each action and command activated be



The events which are recorded are:

- Actions performed by the operator
- Alarms occurred during the course of monitoring the VLF Antenna
- Operations executed by Driver Hardware

T1 Monte Papa Argano Elettrico 1			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Digitale	19/04/2012 12:51:32		
Anomalia PLC Analogico	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
Anomalia Alimentazione Argano	19/04/2012 12:51:32		
✓	⚡	✗	⊗

T1 Centrale Argano Elettrico 2			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Analogico	19/04/2012 12:51:32		
Anomalia PLC Digitale	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
Anomalia Alimentazione Argano	19/04/2012 12:51:32		
✓	⚡	✗	⊗

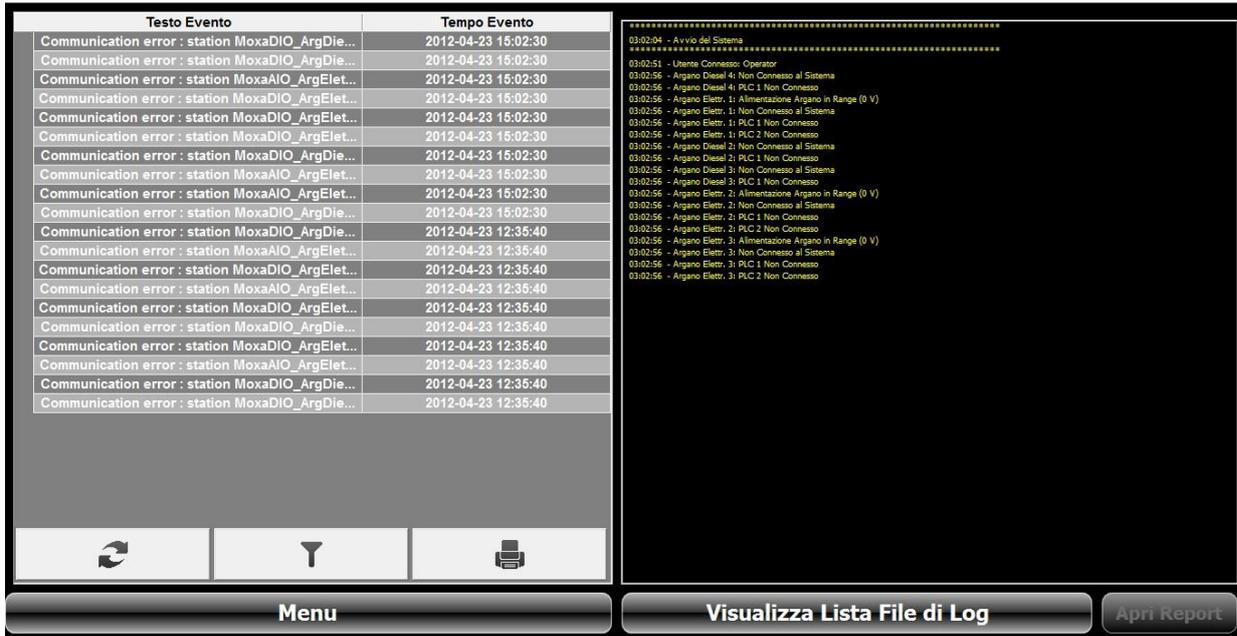
T1 Monte Castellaccio Argano Elettrico 3			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Digitale	19/04/2012 12:51:32		
Anomalia PLC Analogico	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
Anomalia Alimentazione Argano	19/04/2012 12:51:32		
✓	⚡	✗	⊗

T2 Monte Papa Argano Diesel 4			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Digitale	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
✓	⚡	✗	⊗

T3 Monte Papa Argano Diesel 3			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Digitale	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
✓	⚡	✗	⊗

T4 Monte Castellaccio Argano Diesel 2			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Digitale	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
✓	⚡	✗	⊗

T5 Monte Castellaccio Argano Diesel 1			
Descrizione Allarme	Tempo ON	Durata	
Anomalia PLC Digitale	19/04/2012 12:51:32		
Connessione Interrotta	19/04/2012 12:51:32		
✓	⚡	✗	⊗



CONFIGURATION PANEL

The configuration panel is used in the software for setting the parameters needed for the correct working of the winches and software. The parameters available on this screen can be set and modified only by users that have an “Administrator” account, (software administrator). “Operator” account users are only allowed to view this screen.

Since this is a military base run by the Italian Navy is it also part of the NATO Atlantic Alliance.

Therefore the project has been programmed to be used in both the English and Italian languages. The use of a simple command will dynamically change the languages from one to the other with immediate effect. Due to the renovation project and system design engineering, the Tavolara VLF



antenna is now easier and safer to manage considering its strategic importance in modern defense system communications. The project concluded successfully after a trail and validation period that proved the complete reliability of the system and architecture implemented.

Ing. Simone Ciocchi - Sigma Consulting

SIMETEL SPA

Simetel SpA is the user company and responsible for the Tavolara VLF Navy station. After having participated in building the Tavolara VLF station in the late 60s, Simetel SpA took charge of its management and routine maintenance and repairs. Simetel has been operating in the professional and military communication sector since 1959 after already having realized a major part of the M.M. and A.M. radio communication centers.

Simetel S.p.A. design engineers and manufactures special equipment needed for building plant systems, the setting up and running of mobile vehicles, manufacturing electronic equipment to client specifications, or own design. It also ensures regular and special maintenance services of their systems with great experience and professionalism.

A very important monitor system has also been installed to monitor SI/3000 radio electric emissions for multiple antenna fields. This system continuously measures and records the electromagnetic field level in the most critical points of the transmitter antenna field. Simetel SpA realizes integrated turnkey systems and plant systems of any size. This includes the initial design engineering stage, installation and correlated maintenance services.

SIGMA CONSULTING SRL

Sigma Consulting has more than 15 years' experience in electronic system Design Engineering and Integration (hardware and software) and computer programming.

The company operates in the aerospace, naval and land military and develops simulation systems, test systems, mission support centers, on board software and database. In addition:

- *Supplies integrated logistic support services, training and learning, technology transfer, business consultancy;*
- *Supplies Clients with "turnkey solutions" in a partnership based on sharing objectives.*