

Wireless Systems for Geophysical Monitoring



Mission of **WiSyGEO** is design and manufacturing of a family of **new devices mutually inter-connected** with dense coverage capability (every 1-50m) over large areas to guarantee the connectivity of heterogeneous wireless sensors for environment monitoring. Even if the complexity is similar to a large mobile cellular network, smart coordination among many devices guarantees lower costs and rapid deployment.

Among the applications, the most relevant (in term business and volumes) are

- Monitoring subsurface for **oil/gas exploration**. Clients are oil-exploration contractors (e.g., Schlumberger Western-Geco, CGG-Veritas etc..) that employ the most convenient technological solution for imaging the sub-surface for reservoirs' exploration.
- Monitoring in **industrial/urban environment** such as: video-camera surveillance, environmental emergency, urban/highway traffic control, industrial monitoring, etc...

Oil-exploration is the **key target market**. Current cable-based monitoring systems for oil exploration are limited by the logistic related to hundreds of kilometers of cabling (i.e., cable-weight, repairing, layout design, etc...). **SmartGeo** is the **WiSyGEO** key-product line specifically designed for oil-exploration applications. **SmartGeo** has the capability of supporting cable-less large sub-surface monitoring networks without any penalty with respect to cables. Of course, the same **SmartGeo** product can be targeted to other applications where there is the need of wireless monitoring over large areas.

Product in brief

The product proposed is a Scalable, Flexible, Easily and Quickly Deployable Communication System (*SmartCom* system) capable to guarantee the high data-rate connectivity of different kind of sensors for real time cable-free data acquisition, data measurement and environments monitoring for various types of applications. High-level specifications (for final product) are:

- Scalable architecture (that resembles a cellular system tailored for synchronized acquisition)
- Density on nodes (only outdoor): 500-3000nodes/sqkm
- Extension: 3X3km (typical) up to 10X10km or more
- Inter-node spacing: 5-50m
- Synchronized acquisition: all the nodes have to be synchronized with max timing skew of 1/100 msec
- Self-localization capability: most of the nodes should be self-localized without any use of external or satellite systems (e.g., few GPS nodes)
- Low battery-use: operate continuously for at least 60-100h
- Throughput/node: 20-50kbit/sec
- Multi-hop communication for inter-node connectivity and low battery-use.

The *SmartGeo* system is made of:

- *Wireless Units* (WG Wireless Geophones) delivering digital data drawn to/from (any type of) sensor(s)
- *Wireless Gateways* (WSG) collecting data from a group of WGs and forwarding data to the SU
- *Control and Storage Units* (SU) storing data received from WSGs