



DEVELOPED FOR: ETH Zürich (TIK)

Sensor Network measuring Permafrost in the Swiss Alps



ELECTRONIC DESIGN AND DEVELOPMENT SERVICES

Ongoing design, development and production support to PermaSense, a research project operating a network of wireless sensors installed in the Swiss Alps to continuously monitor and measure a variety of physical parameters of the steep bedrock permafrost.

Spatial and temporal resolution of complex environmental systems

Extreme conditions

Installed and operated at high altitude in mountain regions with a permafrost environment, the PermaSense system and all of its component parts has been developed to run reliably at low temperatures and to be able to withstand large, daily temperature changes (in excess of 40°C).

Only accessible by helicopter during summer makes a 2 - 3 year maintenance-free operation absolutely mandatory in order to withstand the long term exposure to the extreme weather conditions including lightning, avalanches, rockfall, frost / ice and snow.

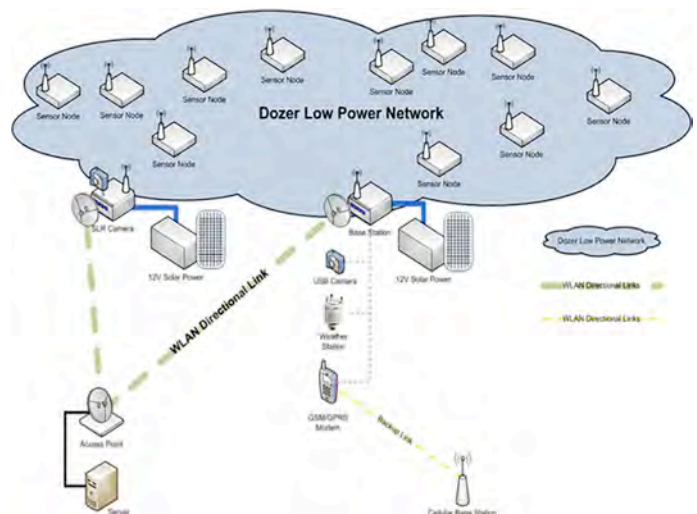


Our contribution

Development of a flexible, ultra-low-power, wireless multi-sensor system, based on the Tynode module to support different types of sensors and guarantee stable operation of the sensor nodes during long-term autonomous operation in high-mountain environments.

System interface board (SIB) comprises:

- multi-channel AD-converter
- environment sensors for temperature & humidity
- de-bugging / test-bed interface
- UART-based sensor & SDI-12 interface
- stable sensor power supply with software control
- versatile power supply with battery & external feed
- precision reference voltage
- reliable compact enclosure
- watertight connectors for sensor interface & antenna



PermaSense I

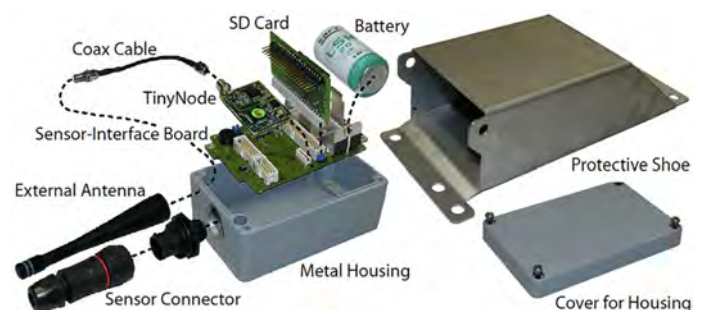
- design & industrialisation based on functional model
- miniaturised sensors & electronics in a robust package
- temperature measurement sensor bars & thermistor chains sensor nodes with "crack meter"
- low sampling rate: 1 - 60 min
- Li-SOCI2 primary cell, lifespan: 3 years
- small batch production

PermaSense II

- development of PermaSense GPS (HW / SW)
- 2-axis inclinometer, all electronics & cables
- 2-dimensional measurement of gap movement
- 12V photovoltaic system
- small batch production

PermaSense III

- development of wireless PermaSense GPS (HW / SW)
- in-mast integration of the GPS receiver & antenna
- wireless system with low-latency data transmission
- small batch production



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