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For the monitoring of hydrometeorological variables, and more generally, for decision support systems, the instrumental in-situ measurement is crucial. Referring to professional micrometeorological stations, there is a problem represented by the high costs of measures. The high cost can be substantially related to the quality of the materials, to the array of industrial production processes and to the costs of skilled workers, needed for the installation and for the maintenance of the equipment. A further problem in the development of such measuring networks is represented by "closed" products which, for structural layouts, data management and communications, are almost always referred to as "proprietary protocols", which push the customer to a perpetual and often non-negotiable "loyalty" to the supplier. This limits the development of modern and efficient measurement networks in countries with limited economic resources.

The "ACRONET Paradigm", presented here, refers to a new model of production, distribution, in-the-field installation of measuring systems connected through knowledge networks, based on the concept of "Open Hardware" which involves the design of shared equipment, activities of self-production and assembling and self-installation and maintenance carried out by the end user.

The model wants to be sustainable. It should allow a start with a low initial investment, and management in complete autonomy, even in countries with emerging economies. The sustainability and the low unit cost of the measure should not be obtained at the expense of measurement accuracy and quality and durability of materials. Low cost can be obtained focusing on ease of maintenance and installation, allowing the use the local labor force, even with low skills, but with high capacity and speed of in-situ intervention and making economies of scale and supplying directly on the market of the hardware components.

The ACRONET paradigm is realized through what we call the five fundamentals:

1. Component assembling
   Shared design, implementation and testing of suitable modular elements to be used for the construction of measuring instruments, through the simple assembly of commercial parts readily available on the market;

2. Open source software
   The design and development of the firmware for the control of modular elements and the software to control the measures and the flow of information between elements adopting open source requirements

3. Open hardware
   Free Publication of the design schemes of the modular elements that compose the measuring instruments, according to the "open hardware" standards. Creation of a community of developers for the hardware.
4. ACRONETWORK Infrastructure
Implementation and maintenance of a technical infrastructure for the remote control and connection of ACRONET instruments made through environmental knowledge networks. The network allows the management of users’ communities and the geographic contextualization of data.

5. Accuracy
The ACRONET modular elements allow the continuous monitoring and suitable quantification of the physical consistency and accuracy of measurements, by using appropriate self-diagnosis and intrinsic validation techniques. This differs from the usual practice that guarantees only (and not always) the accuracy of the instrument, after lab tests, and the compliance with standards of production.

The general architecture of ACRONET refers to the general definition of "Measuring System" as defined by the third release of the International Vocabulary of Metrology (VIM3, [1]). Following this definition, a measuring system is composed by measuring instruments and measuring chains. The measuring instrument is the basic element and it is connected with a series of other modules to form a measuring chain. Each measuring chain is composed by ACRONET modular elements and third party commercial elements. Appropriately selecting a specific chain, and the commercial elements that compose it a specific "Configuration" is obtained.

All configurations are connected through the ACRONETWORK infrastructure, implemented and maintained in efficiency for data collection and display.

The following three families of configurations are currently available

A. Urban Configurations: designed for individual "amateur" installations or professional high-density networks installed in an urban environment. The measurement chain requires access to electricity network and internet (Urban connectivity), and an adequate external space for the correct positioning of the sensor.

B. Rural Configurations: designed for in-the-field professional networks. The configuration does not require access to electricity network and is ready for the use of a GPRS or satellite connection to send data to the data collection centre.

C. Mobile Configurations: they are designed for the collection of measures on mobile devices.

The ACRONET Paradigm finds its application in many areas, not only water-related, including, without limitation: hydrometeorology, civil protection, agriculture, climatology, air and water quality, waste, security (Webcams), environmental management, telecommunications, etc..

References