

Fire fighting by simulation

Of all seasons, everybody particularly appreciates the Summer... and holidays. The sea, the mountains, the sun, beautiful girls with their suntanned bodies... All the southern regions of the France, Spain, Italy, Portugal and Greece, are the targets of these happy holiday-makers. In this collective and praiseworthy euphoria, nobody thinks of the potential danger of aridity and wind ...

Nevertheless, hundreds of thousands of acres of forest are the target and victim of a plague that rages every year at the same period : Fire. Time after time this disaster mobilizes all those who fight the flames, on foot or piloting their Canadair, exposing their lives with determination and courage resembling heroism to protect their fellow countrymen. How not to be filled with sadness when faced with the horrible scene of desolation, when the fire has covered an enchanting site of greenery with a sinister black coat, destroying all life. Can this apocalyptic plague, which we suffer for decades, be finally vanquished ?

Indeed, certain people began thinking, notably Henri Boccia, CEO of the company Smart Packaging Solutions, who, wishing to diversify his activity, approached the field of environment and the problem of fire. He explained to us : " We decided to direct our research on everything concerning fire detection. We have expertise in radio frequency, packaging and many other fields, and today there are solutions that we could use. There are lookout posts all over the place, infra red cameras, video cameras, satellite observation... but all these processes are very expensive and very often limited in use. Cameras enable us to see the smoke, but that doesn't necessarily mean that the fire started in the same place. Consequently, we decided that we must position sensors in the countryside. We made a partnership agreement with a young company with excellent competence in radio frequency, and we sought for a system that could detect the fire as soon as it is on the point of beginning."

This reflection became reality, giving birth to the project " FIRE", which entails a whole range of solutions concocted by a partners' conglomerate composed of researchers, scientists, computer specialists and manufacturers, united for the same tar-



Canadair larguant sa charge au dessus de l'incendie

get : to reduce as much as possible causes of fires. This partnership includes 7 different entities, all strongly determined to surmount this plague. Grouped together around the project manager, the company Smart Packaging Solutions, which contributes for manufacturing the " packaging sensors " for which it has implemented a low cost process, we find : CRYTIRIS, which is developing a "Secured Radio Frequency " system, the Paul Cézanne University/CNRS

(IM2NP laboratory) working on the conception and characterisation of IR opto-electronic sensors, the University of Provence/CNRS (IUSTI laboratory) working on the conception of a fire simulator and the optimisation of the network of sensors on the site, CEREN (Valabre) which is working on experimental validation at various levels (fire tunnels, gas emissions, etc.), the SID13 in charge of tests to acquire experience on real fires, and the Protection Civile-06 (State-financed civilian rescue organisation), contributing with institutional and operational expertise. There are also the associated partners: ACTIS Engineering, for programming the data base, CRISE, in charge of data integration and 2D / 3D cartography, SFR in charge of routing the transmissions, SEP in charge of marketing and merchandising, and SERIMED, which finalizes the integration of " FIRE CODE ".

It is only logical that this assembly of collaborative determination and various competence towards an asserted objective, should be crowned with success. The project got off to a good start when the Risk Management and SCS World Cluster gave it a brand name. The financing is also pluralistic, since OSEO, the Provence-Alps-Côte d'Azur Regional Council, the Bouches-du-Rhone County Council and the oil company TOTAL are involved in the project, representing a global investment around 2 million euros.

Now we must try to understand how it works ...

Image Dantesque et désolante



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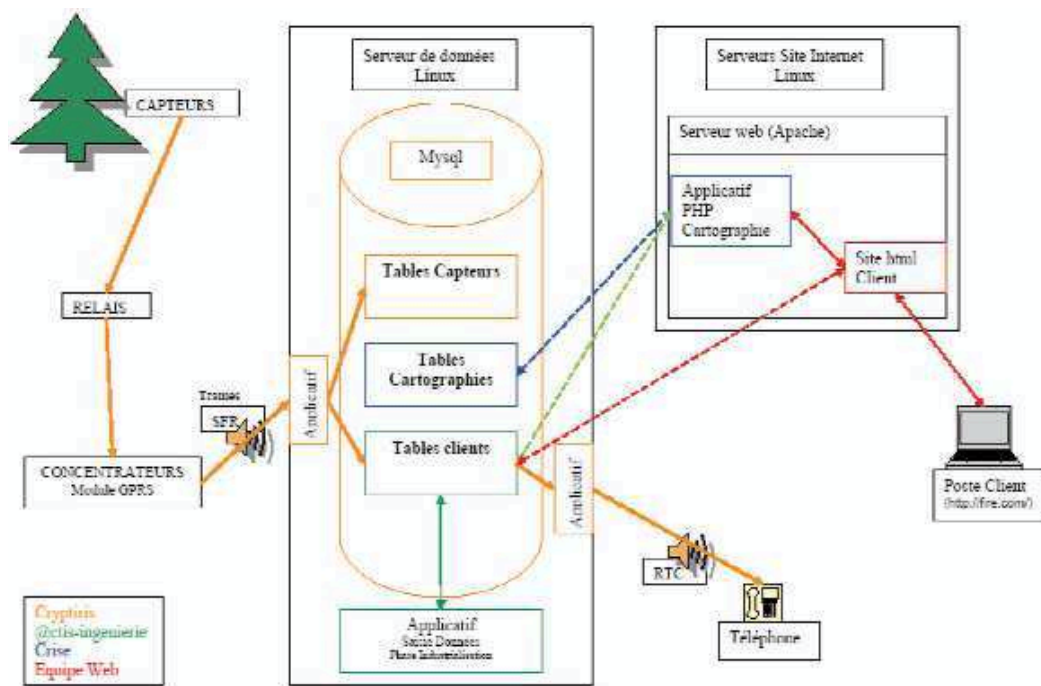


Schéma de Fonctionnement du système Fire

First of all, sensors (resembling a credit card, slightly longer) are fixed on tree trunks bordering a forest on a precise perimeter, spaced out according to a pre-defined logic corresponding to the desired results. (The GO / NOGO sensor is geo-localised. It emits its serial number and the measured air temperature to its relay, according to a period of time. It can be parameterized according to the seasons and the climatic conditions). These sensors are connected to a relay station, which collects the information and passes it on through a concentrator (GPRS base). This base passes on the information via a Secured Mobile Infrastructure, which in turn transmits it to an application base that collects all the information concerning the present situation. It can be information relative to local humidity, temperature, or any indication alerting the risk increase or the beginning of fire. Jointly, a digital modelling system will predict the evolution of the fire, from its point of departure or a detected fire front, by taking into account the topography of the ground, the vegetation and the wind, to calculate its force at a given point. The modelling will also serve to parameter the "Fire Sensors" according to the targeted objective, which can be to detect the fire when it begins or the arrival of a fire front, and it can also enable the simulation of the spread of the fire in a space of time. Since this information is transmitted on highly

efficient frequencies in terms of speed, it requires very little time to visualise the location and simulate its propagation (60 seconds for 7 hours of fire). This whole process will enable the specialized forces to better anticipate the required action and reduce the time of intervention, making it possible to extinguish the fire more quickly by foreseeing the importance of the necessary forces and allocating the most vulnerable places that need to be protected. At this stage, the visualization and especially the simulation of the departure and the propagation of the disaster, displayed on a 2D or 3D map, enables the commanding officers to better coordinate the actions between the land and air intervention forces, which makes this new invention an indispensable, efficient device of incontestable strategic importance.

Protection of staff in dangerous environment

The Volatile Organic Compounds, that is "Terpenes", present another problematic phenomenon, which is among the parameters analyzed by the designers of "FIRE". These are gas products emitted by the vegetation when it is subject to moderated reheating (strong sunshine) or excessive heating during forest fires. These poisonous, inflammable gases are atmospheric pollutants which can accumulate in valleys

or pathways. This accumulation becomes very dangerous for the firemen because their inflammation, due to firebrands or by direct contact with the flames, can cause a sudden burst of fire, similar to a flash of lightning striking the area. This "Generalized Lightning Explosion" is the cause of very serious and often mortal accidents, as at Palasca in High Corsica in 2000 when 6 hectares burned within one minute. To fight this phenomenon, the "FIRE" project managers have decided to extend their research,

as Henri Boccia explains: "We have a technological know-how which enables us to discover chemicals ; we could use this to make a Terpene detector, providing that the chemical exists or that we can create it. For that purpose, we contacted the CEA (Atomic Energy Authority) and the CNRS (National Scientific Research Centre) who replied that they would attempt to find this product. But even then, we must be capable of putting it on the chips. We therefore studied the feasibility of a Terpene detector which could be put on firemen and on their vehicles to give the alarm. But to find the answer to this detection requires further development on behalf of the CEA and CNRS because the required product does not yet exist." This is an initiative that will certainly arouse the firemen's interest !

We all hope that "FIRE" will enable us to believe that our beautiful forests, whether they be Provencal, Spanish, Italian or Greek, will at last be protected from these horrific devastations that destroy our landscape, and that our firemen will finally benefit from good protection. But beware, "FIRE" does not prevent the duty of each and everyone to respect the environment and nature. Let's hope that this message will be received loud and clear ...

