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"Using Hybrid Wireless NOMOHi Devices in Green Rural Telecommunications Networks"

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Using Hybrid Wireless NOMOHi Devices in Green Rural Telecommunications Networks

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1. NOMOHi Networks
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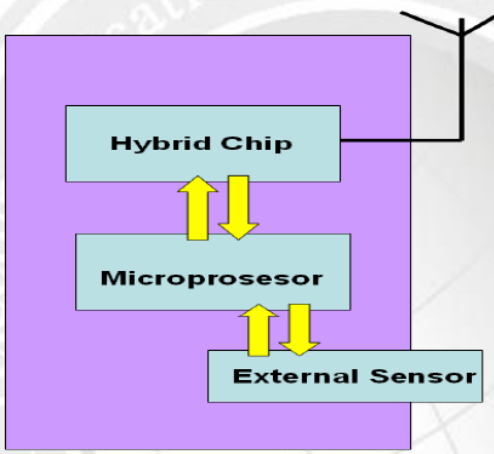
NOMOHi Networks.

Architecture NOMOHi (Node, Mobile, Hybrid, Intelligent), which combines devices capable of communicating simultaneously and collaboratively on two or more radio communications technologies, supporting processes of artificial intelligence for it. It establishing a classification and ranking is based capabilities and radio communications services. A physical architecture is recommended by 5 layers of abstraction that can be changed and updated without affecting the communications interoperability and 6 layers for the Security Architecture.



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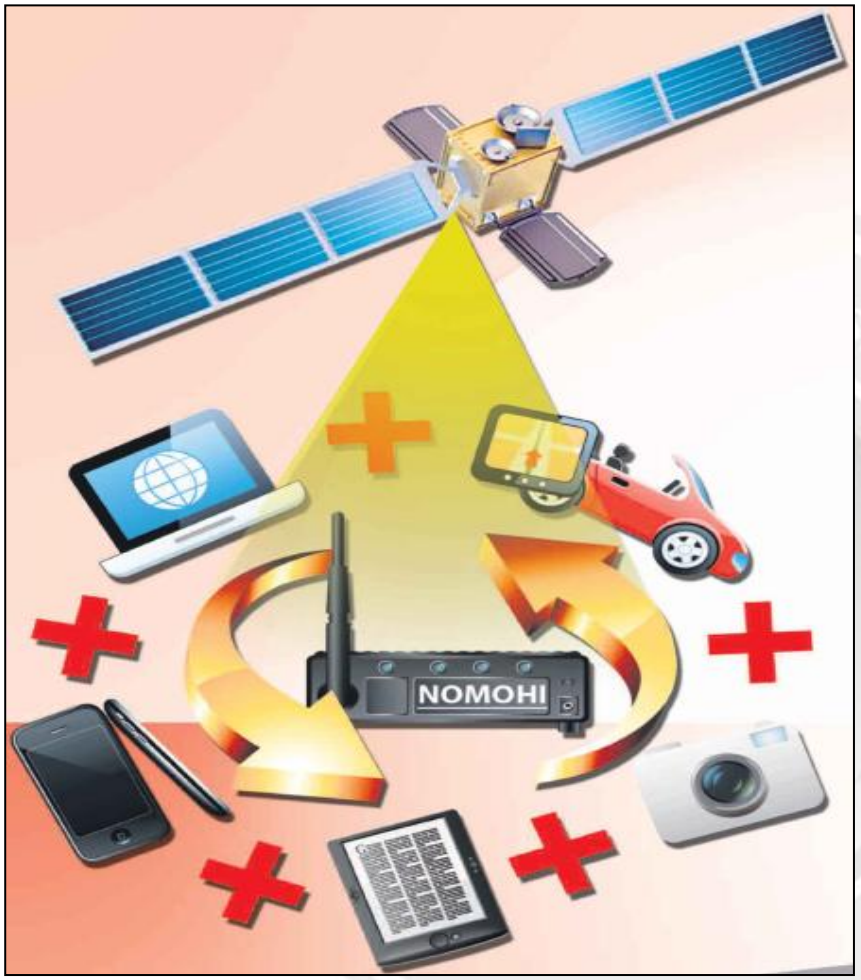
NOMOHi Networks.

It specially describes the characteristics of sensor devices NOMOHi 802.11/Bluetooth/UWB and the WiMAX 802.16e/802.11 network services, and its potential practical applications for the distribution of satellite educational television content while it can be used simultaneously for the survival of communication in case of emergency in rural zones, Using renewable energy sources and minimum consumption, no need to implement complex technological infrastructure, and thus obtaining the lowest environmental impact.



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NOMOHi and Wireless Sensor Networks.

Used Hibryd Gateway Node in the eSense Project

Wireless Sensor networks: 802.11b/Bluetooth/UWB Technologies and Applications: Supervision and control of temperature, humidity, tank levels, movement of machinery, safety, vibration, all these features can be controlled by sensors with a very low power consumption, but with enough capacity to run complex software applications and reconfigurable, and sufficient capacity to Obtain their energy by a simple battery, solar cell, or collectors of sensitive vibrations, ocean waves or any other available energy. The main problem with these devices is how to manage energy consumption without reducing the radius of coverage and transmission speeds. Current models of networks of sensors deployed in the market (and that really work) does not present an economically viable solution to the economic side, as expenditures due to changes in battery (as well as workers who do) and re-enter the node to the network, are really important.

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Artificial Intelligence / NOMOHi

The classical extreme work situations in which currently find systems capable of self managed and respond to situations of maximum stress computer and communications (industrial environments, oil fields, disaster areas) have been so far, a very important goal towards which converge at many research efforts, but currently, and analyzing the current reality of our planet, we find a permanent and fierce struggle to try to reverse the changes that directly affect the ecological balance and the need to preserve and utilize new energy alternatives, to establish optimal relations in terms of recycling junk technology and the environment, but above all to secure (not to endanger) human resources, while costly, have created a frame of reference that should be taken into account when designing and deploying communications networks, especially in areas of high environmental impact.

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Artificial Intelligence / NOMOHi

One way to address this situation, is to design systems that actually make decisions in situations of daily living (and extreme) in their behaviour and work autonomy, and this necessarily involves giving to our system, some level of "intelligence" that of that control. Now the challenge is posed on the fact that the devices of these networks' intelligent and autonomous "should be able to", with a minimum of technological resources (computer, communications and overall energy). Is not that a contradiction in this statement? Yes and no. As new models are shrinking and efficient CPU, microcontroller, FPGA, communication protocols increasingly powerful (and less demanding in terms of energy) and especially the development and adaptation of artificial intelligence techniques to problems related to the telecommunications that require little hardware to be implemented (some time ago and the implementation of networks "fuzzy" have demonstrated efficiency in sensor networks, as well as routing protocols based on bio-inspired algorithms), could indicate a convergence "carry more and more" to optimize our systems using these techniques, perhaps the path will be difficult when we find the restriction on the design due to economic reasons.

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Survival of communications

The node can select which type of radio communication can be used. To do this, use appropriate criteria such as need for transmission speed, the volume of data to transmit and energy capacity, among others. two nodes that are in the range of communication of both, and that the communication requires the minimum quantity of energy and computing Efforts to transfer information, it will use in that moment the "Minor" technology of communications (Bluetooth, Zigbee, UWB, ANT protocol, etc.) to Establish the communication, raise one of the nodes or both, begin to move and go away with the real Possibility of leaving the range of common covering; in order not to finish the communication, the issuing node will immediately detect by means of specific procedures that this happens, immediately notifying the destination node to the change of "Minor" communication type to another that it to enlarge Full Version covering that range and not to lose the continuity of the communication, beginning in both nodes the necessary functions to adapt the emission and reception of the format of the new packages, as well as the minimization of losses caused by handover and overflow of lines.

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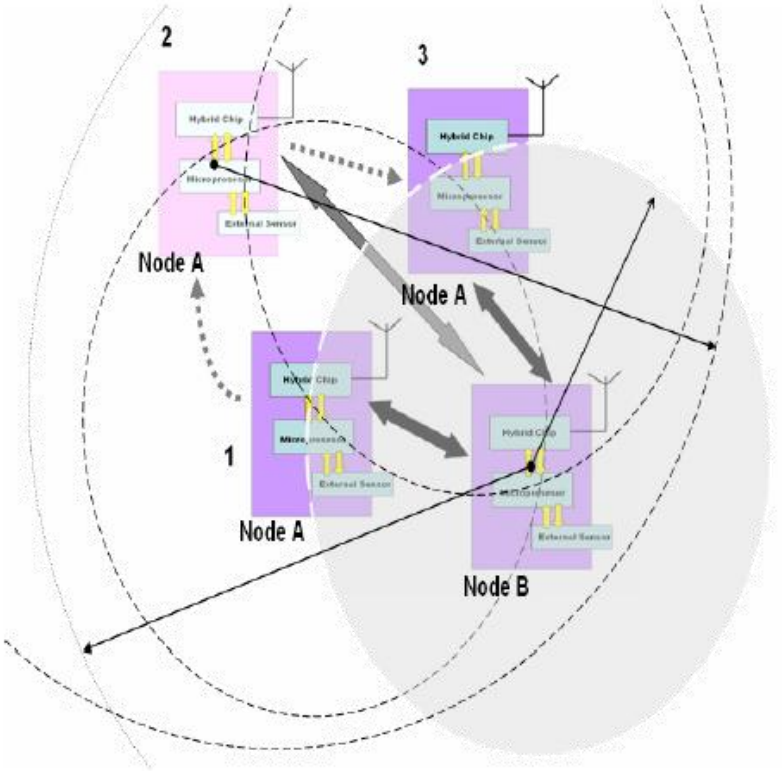

Survival of communications

If the nodes enter again in the covering where the "minor" communication technology can be activated again, it will begin the mechanisms to adapt and to drive again the flow of data in that format (Ad Hoc mode).

If the node is able to detect when their primary communications ethnology will fail, should undertake the appropriate mechanisms to keep the current communication, or at worst, attempting to establish a new communication using a different protocol for transmitting your data. A network of sensor nodes can communicate with them via UWB.

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Green Rural Telecommunications

In the extreme geographic network, moving a node goes out of range signal transmission. Loses communication (or begins to fail to detect the UWB communication), then try to connect to its technology "Major" (802.11, for example) to another sensor to keep the connection active (connection in parallel with its own UWB), and thus send their data flow through this, this situation would continue until re-enter your network communication with UWB. The intermediate node, then become a temporary "Gateway". As a Service Network, The node can use all their communications technologies simultaneously. In this way, could function as a stretch where traffic circulating communications from different networks are not supported in principle. A mobile node (or fixed), capable of receiving signal WiMAX, which maintains a parallel connection 802.11, want to serve "Gateway" to devices that could only connect via 802.11 (for economic reasons, for example). The use of television and radio signals via satellite, provided by the satellite "Simon Bolivar" (C-band) its possible too.

(Venesat-1)

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Green Rural Telecommunications

And of course also can be given complex scenarios, where all these 3 situations described may be put forward and given the case, for example, that a "node nomadic" (the Laptop, WiFi phone or a tourist PDA) could connect via 802.11 Ad hoc to a meteorological sensor fixed to a half of the track, and that simultaneously transmitted via UWB to your Sensor network, you get the signal, "Jumping" from node to node, to one node NOMOHi 802.11/UWB, and east to the instead, transmit the signal to another node NOMOHi Wimax / 802.11. The bottle neck problems and phenomena related to the handover, are beyond the scope of this work, but must be taken into account when planning a network deployment infrastructure with this suggestion.

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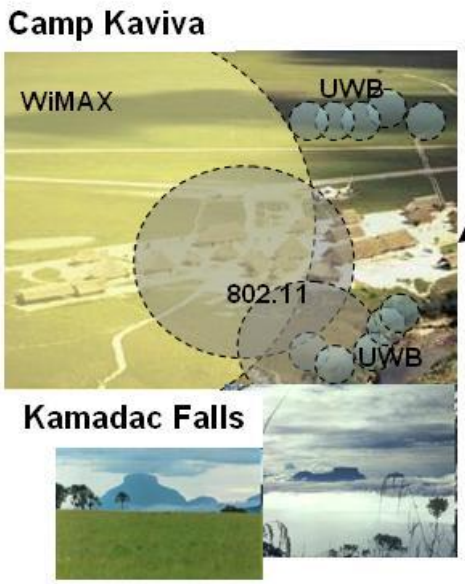

"Gran Sabana Project"

The Great Sabana project proposes the use of sensor networks, meteorological and fire detection in inaccessible areas and near indigenous communities in southern Venezuela, in Bolivar state. The use of television and radio signals via satellite, provided by the satellite "Simon Bolivar" (C-band) mainly provide educational content for schools in these communities and those residents who may have facilities for receiving direct connection the satellite signal, or via a WiMAX signal that would carry the signal from base stations (and satellite signal reception) to users with communication devices that receive its signals, or 802.11, Bluetooth and UWB using a NOMOHi network. These "nomadic nodes" not only function as clients, but at some point, also form part of the communications network itself.

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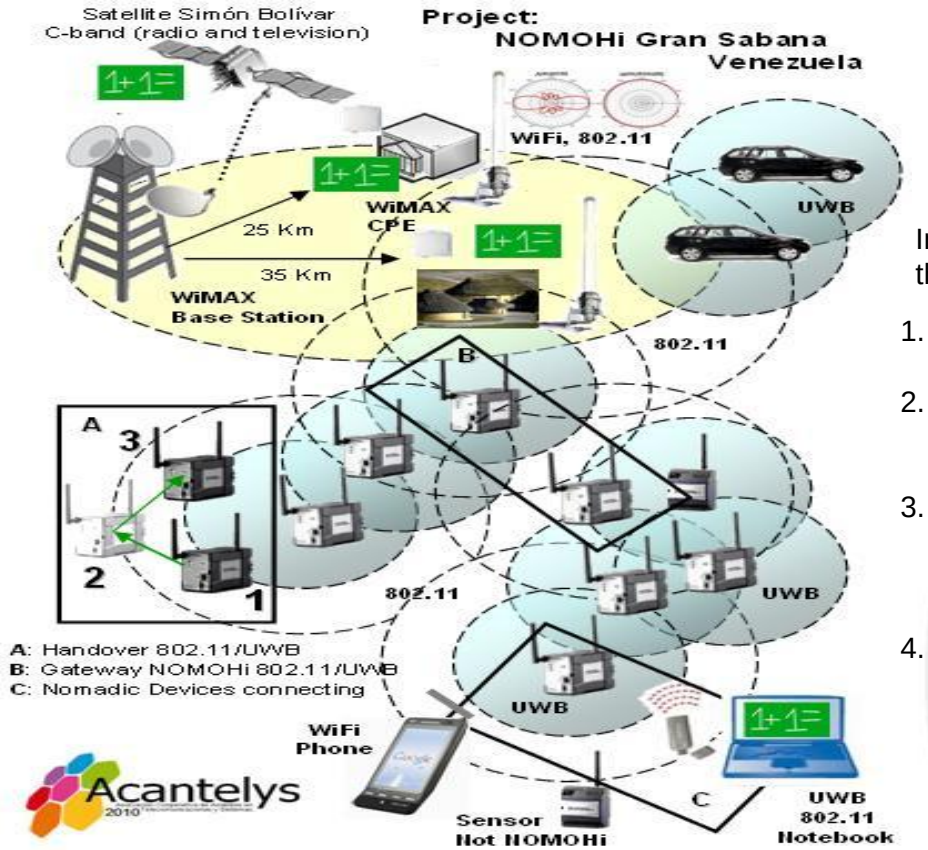

"Gran Sabana Project"

Important things to consider for the design of this network:

1. Types of used nodes: sensors based on UWB and 802.11; some fixed WiMax nodes.
2. Energy expenditure required: we provided the ability to nodes on the solar and rechargeable batteries for vibration and temperature change.
3. We took account the restrictions on the transfer of data and multimedia content (bottlenecks), and the extent of the nodes dependent on the sensor network.
4. We respected the prohibition not to alter the environment using fixed telecommunications facilities (towers, cabinets).

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In Loving Memory Of Tia Yahayra and Tio Eusebio.

Rest with God, but always near us.
give birth to the day, but remember to give us sunlight.
care for the garden of the rainbow, because we'll be together someday.
Again.

Descansen junto a Dios, pero siempre cerca de nosotros.
hagan nacer el día, pero recuerden darnos la luz del sol.
cuiden el jardín de los arcoíris, pues algún día estaremos juntos.
Nuevamente.

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Marzo 2012, Miyazaki, Japan.

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"Las naciones marchan hacia su grandeza al mismo paso que avanza su educación".

"Nations march towards greatness in step with advancing their education."

Simón Bolívar

Thanks!

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