Realizing that CR technology has the potential to exploit the inefficiently utilized licensed bands without causing interference to incumbent users, the FCC released a Notice of Proposed Rule Making which would allow unlicensed radios to operate in the TV-broadcast bands. The IEEE 802.22 working group[23], formed in November 2004, is tasked with defining the air-interface standard for wireless regional area networks (based on CR sensing) for the operation of unlicensed devices in the spectrum allocated to TV service [24].
Dynamic spectrum allocation has become a key research activity in wireless communications field and in particular a key technology for “The Network of the Future” objective proposed in ICT FP7 .

2.2. Cognitive Networks and Cognitive Radio Networks

On the last years, “cognitive” or “smart” have become trending topics being applied to many fields, included to communication technologies. Having a look into the 90s literature, easily at least we find mentions about smart antennas[25], smart radios[26], smart packets[27], CR[4][15], cognitive packets[28] and CN[29][30]. Nevertheless, there does not seem to exist a commonly accepted definition of what these terms mean when applied to networking technologies.
The concept of CN has been hanging out the collective psyche of the networking and wireless researching field for long. The first approach was made by Mitola[4] when briefly describes how the CR could interact within the system-level scope of a CN.

Saracco[31] talks about CNs in his investigation into the future information technology. Mähönen et al.[29] discuss CNs with respect to future mobile IP networks. None of these previous references, however, express clearly what a CN is, how it should work and which problems it should solve.
The role that CR had in inspiring the formulation of CN concept, made, in some cases, CNs being described as networks of CRs[4][32]. Recent research can be divided into two categories: CRN (Cognitive Radio Network) and CNs. For CRN, Mitola mentions how CRs could interact within the system-level scope of a CN[5]. Neel[33] and Haykin[15] continue this line of thinking, examining multi-user networks of CRs as a game. The scope of CRNs still remains primarily on MAC and PHY layers, but now operating with some end-to-end objective. In a CRN, the individual radios take most of the cognitive decisions, although they may act in cooperation.

Some suggested applications for CRNs include cooperative spectrum sensing[34][35] and emergency radio networks [36]. Raychaudhuri presents in [37] a general architecture for CRNs.
Regarding CNs, Clark proposes, in which was perhaps the first mention of CN rather than CRN, a network that can

“assemble itself given high level instructions, reassemble itself as requirements change, automatically discover when something goes wrong, and automatically fix a detected problem or explain why it cannot do so.”

This would be achieved with the use of a KP (Knoledge Plane) that transcends layers and domains to make global cognitive decisions. The KP will add intelligence and weight to the edges of the network, and context sensitivity to its core. Saracco stated[31] that the change from network intelligence controlling resources to having context sensitivity will help “flatten” the network by moving network intelligence into the core and control further out to the edges of the network. CRNs differ from CNs in that their action space extends beyond the MAC and PHY layers and the network may consist of more than just wireless devices. Furthermore, CN nodes may be less autonomous than a CRN node.
First full definition of CN was postulated by Thomas[38] in which was his PhD Dissertation. Hi proposed the idea of a CN:

a network composed of elements that, through learning and reasoning, dynamically adapt to varying network conditions in order to optimize end-to-end performance. In a CN, decisions are made to meet the requirementsof the network as a whole, rather than the individual network components.

The adaptations that are performed over usual networks are commonly reactive, taking place after a problem has occurred. Thomas advanced a paradigm that had the promise to remove these limitations by allowing networks to observe, act, and learn in order to optimize their performance. CNs description in [38] talks about intelligently select and adapt radio spectrum, transmission power, antenna parameters and routing tables. By formalizing the design, architecture and tradeoffs of cognition at the network level, Thomas work had a broad impact in advancing the paradigm of intelligent communication devices.

Wireless Sensor Network

A WSN consists of spatially distributed autonomous “nodes” not relying on a pre existing communication infrastructure, to monitor physical or environmental conditions. Number of nodes vary from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Nodes are generally simple and low-resources embedded system with high cost and size constraints. These constraints result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. Usual architecture of a node is divided in:

Sensing subsystem. Responsible for sensing physical parameters of the environment. Typical monitored parameters are temperature, sound, light, humidity, vibrations, pressure, movement, presence, body registers, etc.
Computational subsystem. It process the information obtained by the sensors and process it. It controls all general operations of the node, and runs the desired application.

Communication subsystem. To carry through all the messages transmission and reception with neighbor nodes. Main goal is to make the information gets to some destination, usually a gateway or storing node.

Power source. It supplies the energy needed by the device to perform the programmed task.

The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in a wide range of applications, considered as the main technology to develop intelligent ambiences:

Industrial Monitoring. WSN are applied mainly for machine health monitoring, water quality or management, and industrial sense and control applications avoiding wire deployment.

Structural Health Monitoring. Distributed sensors over infrastructure as bridges, tunnels or buildings help to collect data to prevent damages or problems deviated from load excesses, weather, vibrations or stress.

e-Health. It presents new uses for WSN to sense body parameters and observe behavioral patterns. These networks are used to detect or prevent occupational