

**Telecom Italia response to the call for public input  
on the draft RSPG report on Cognitive Technologies  
(RSPG09-299)**

**22 December 2009**

## Introduction

Telecom Italia welcomes the Radio Spectrum Policy Group invitation to express comments and views in relation to the draft RSPG report on "Cognitive Technologies".

Telecom Italia general opinion is that, since frequency bands for specific applications could be harmonised at European level, taking into account possible on world wide basis ITU-R Recommendations and ITU provisions, in advance studies and evaluations on technical issues for possible and voluntary application of Cognitive Technologies in a multi-operators context should be mandated also by Regulators. Generally speaking, the need for future regulatory measures applicable to Cognitive Technologies use as a tool to improve radio resource management and interference handling can be evaluated just after that the complete set of technical and regulatory evaluations and evidences will be released by recognized European normative bodies.

The knowledge of the potentialities of such systems is important and Telecom Italia is of the opinion that a set of normative studies is needed to investigate this issue, even in preparation of WRC-12 and even in a long term view. The same ETSI, in its recent Technical Report<sup>1</sup> stated that *"Generally, Cognitive Radio is seen as the technology for [...] flexible use of spectrum. However, the full fledged Cognitive Radio encompasses technology in the far future, due to its high complexity. Consequently, in the close future further studies and research activities are needed. Once said studies will demonstrate feasibility and reliability of such technology, in a long term perspective, elaborated standards have to be developed accordingly"*.

In particular, the reliability of the entire process, impact of possible interference handling as well as viability of the co-existence need to be carefully and in advance evaluated by CEPT and ETSI.

Nevertheless, in our opinion, Cognitive Technologies are an overestimated technical proposal either to alleviate spectrum scarcity problems, either in providing more efficient use of spectrum, above all as a tool to enable coexistence of different technologies and services in the same frequency bands.

In any case, like any other technical solution, possible commercial applications must pass through the usual standardization and testing process, and the market itself will apply the products proposed by the industry according its convenience.

Moreover, any study should include all the possible scenarios, for example, in the case of Cognitive Technologies, their use by an operator of a radio system to improve the management of its assigned spectrum resource or the use of the cognitive technology as e.g. an enabler for collaboration between the public land mobile networks and other wireless networks.

## Overview on Cognitive Radio technologies

Cognitive Technology systems are currently under a preliminary phase of study, and the first outcomes suggest severe limits of reliability and affordability in their future applications, especially regarding the basic question of determining if a channel is used or not.

The secondary use of a spectrum band primarily allocated to an authorized (and investing) operator could, in any case, increase the risk of interfering with such primary service, causing a collapse of the quality of the primary service and a potential economic loss for the investing operator, with possible effects on the perception of stability and profitability of market itself due to premature regulatory decisions.

In any case, up to now, the only example of real potential, future application of Cognitive Technologies, i.e. the TV White Spaces, could result in a limited and partial applicability in Europe, where no relevant areas exist in which allocated frequencies are unused (such as e.g. in USA), because of the almost full coverage by the broadcast networks in place, and the future wider deployment of Single Frequency Networks (SFNs), indentified by the same EC among the initiatives to further increases in the potential size and usability of the

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<sup>1</sup> ETSI TR 102 838 V1.1.1 (2009-10) - Reconfigurable Radio Systems (RRS); Summary of feasibility studies and potential standardization topics

digital dividend<sup>2</sup> as these networks are significantly more spectrum-efficient as they can cover larger geographical areas without changing carrier frequencies; in practise, the European scenario results to be almost incompatible with any TV White Space based solution.

## **Radio Environment**

The need to “map” the radio environment in which Cognitive Technologies work is, in our opinion, one of the main elements of complexity that turns such approach an overestimated solution:

- in case a pure sensing solution is considered, as the same Report may suggest, the “hidden nodes” and the “pure receiving” devices are unaffordable and not resolvable issues;
- CPC and Databases would need a relevant “back office” infrastructure just to manage the information regarding the availability of spectrum, which in the majority of cases could not be present at all.

Anyway, Cognitive Pilot Channel in our opinion is the only solution that, currently only theoretically, may be considered, as it is at least based on a radio network solution approach, and may be embedded in the overall existing and/or future infrastructure.

Regarding SDR systems, we deem that its application to handsets or terminals carries the risk of alteration of the transmitter parameters, either unintentionally (malfunctioning, code download fault) either intentionally (viruses, code hacking to let the use of bands or parameters not allowed by the regulation). Up to now, only the application to terminals distributed by network operators could avoid such risks.

## **Access to spectrum by CR and implications on regulations and licensing**

Telecom Italia is strongly concerned with the approach that RSPG defines as “vertical sharing”: the same given definition<sup>3</sup> risks to describe the “null set”, as in our opinion it’s practically impossible that different terrestrial radio systems operating in the same spectrum portion do not interfere among themselves.

As regard the approach that RSPG defines as “horizontal sharing”, considering that, according to our evaluations, probably the cost to implement such solutions will be greater than the related benefit, our opinion is that:

- in collective use of spectrum model, and only in the hypothesis that the collective use spectrum band is well defined and limited (if the hypothesis is not complied, we come back to the case of vertical sharing), Cognitive Technologies may help in optimizing the shared spectrum, as for example in a limited area like an airport where different Wi-Fi hotspots, offered by several providers, are operating. Nevertheless, we don’t see the possibility that new portions of spectrum are designated, in the future, as “licence exempt use”, therefore the cases in which this solution may be applicable are extremely limited.
- In tradable or leased spectrum use, Cognitive Technologies may, perhaps, help in managing a limited portion of spectrum shared between different services or technologies; in our opinion, the “ex ante” current standardization and normative activities developed by the responsible entities (CEPT and ETSI) will dramatically reduce these occasions.

In any case, Regulatory Authorities, when Cognitive Technologies should be demonstrated as an effective viable approach in specific frequency band, should strictly ensure, also through appropriate regulation measures, that any use of such technologies does not decrease service quality and reliability of public mobile (both existing and future) networks, considering Cognitive Technologies based infrastructures intrinsic limits.

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<sup>2</sup> COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - Transforming the digital dividend into social benefits and economic growth – 28 October 2009

<sup>3</sup> [“The cognitive radio is only allowed to utilize frequencies within the band as long as the existing user(s) is not affected, i.e. the cognitive radio must not cause harmful interference to the existing users”]