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Radio Spectrum Policy Group Call for Input on the Cognitive Radio Draft Report

RSPG09-299

28 December 2009

Orange welcomes the opportunity to share some views with the Radio Spectrum Policy Group on the Cognitive Radio in Europe. In addition, Orange thanks all the national and EU administrations, which are members of RSPG for their interest in Cognitive Radio System issues in general and for the call for input on the Cognitive Technologies (RSPG09-299).

1. General remarks

Orange would like to stress that the Cognitive Radio is considered as an emerging and disruptive communication technology intended to improve the overall efficiency of the spectrum use. As such, the cognitive radio systems might profoundly impact many aspects of communications. However, Orange believes that we are still at an early stage of the understanding and development; so, it seems premature to widely deploy without careful consideration of technical and regulatory issues.

2. Deployment scenarios for cognitive radio systems

The ITU-R WP1B has defined the Cognitive Radio System (CRS) as a radio system employing technology that allows the system:

- o to obtain knowledge of its operational and geographical environment, established policies and its internal state;
- o to dynamically and autonomously adjust its operational parameters and protocols according to its obtained knowledge in order to achieve predefined objectives; and
- o to learn from the results obtained.

In parallel the ITU-R WP5A is currently drafting a report on cognitive radio that includes specific section on the scenarios which include the use of CRS technology by an operator of a radiocommunication service to improve the management of its assigned spectrum resource as well as an enabler for opportunistic spectrum access amongst system operators without prior agreements.

Orange believes that Cognitive Radio term should not be limited to opportunistic spectrum access. Instead, Orange supports modifications in the final RSPG report to clarify the possible uses of cognitive elements for other non opportunistic uses.

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3. Regulatory consideration

In opposition with other parts of the world (USA in particular) where declaration of conformity, type approval or registration of equipment are the rule, Orange considers that the current R&TTE Directive based equipment authorisation regime in force in Europe does not seem appropriate when considering software defined radio and cognitive radio equipment. Therefore, appropriate modifications need to be developed, in particular to ensure a consistent regulatory regime and solve possible responsibility issues due to equipment malfunction.

- Sharing responsibilities

Orange believes that sharing responsibility issues need to be carefully understood and appropriately clarified for the cognitive radio systems.

Typically, in the case of conventional equipment, it is the responsibility of the manufacturer of equipment to ensure that a particular piece of equipment fulfils the requirement of the R&TTE Directive, in particular concerning the avoidance of interference as stated in Article 3.2 .

However, in the case of cognitive radio equipment which, in some extent, may be seems as being closer to IT equipment, a "manufacturer" equips a cognitive device with intelligence (hardware or software) that allows the device to learn how to behave, and this behaviour may be dependent on the environment. A case which deserves special attention is when several manufacturers and/or service providers are involved. This could be the case, in particular, when one manufacturer builds the device, another adds software to it and a third one (or more than one) provides further information to that device and to its software in order for the device to be fully operational.

- Network connection

Control of the terminal connected to a network should remain within the responsibility of the operator, in accordance of Article 7 of the R&TTE Directive.

Orange supports robust protection of the equipment should be ensured in order to avoid the occurrence of virus and malwares which could impact the network. For instance, one solution would be to include the ability to shut the transmitter down when cognitive radio device does detect malfunctioning.

- Monitoring of Agile Systems

Orange would like to highlight that adaptive systems, and cognitive systems probably even more than others, are very difficult to observe, identify, and determine, when necessary, as a source of interference, in particular because they are frequency "agile", and do not necessarily transmit at all times. As a consequence, it would be even more difficult for those observing how much spectrum is used to associate transmissions with the originating devices or for other cognitive devices to identify who is doing

what. Therefore, the issue of "2G" cognitive devices which will have to observe both traditional devices and cognitive devices to make their own decisions, should be carefully adressed.

4. Feature to obtain knowledge of the the radio environment
- Sensing

As expressed in the draft report on cognitive technology, Orange believes that the sensing technologies are still at an early stage of development and do not seem ready for wide deployment in the context of mobile and wireless communications. Several major issues such as the hidden node problem or definition of the thresholds still need to be solved.

Furthermore, Orange has the view that sensing operation should be carefully considered in order to avoid any risk to sterilise/frozen part of the spectrum due to the limited possibilities to evolve the technology of the primary services and to introduce new primary services.

- Beacon transmission

Orange notes that, for the out-band Cognitive Pilot Channel (CPC), support from international community is extremely limited due to cost of deploying a network of beacons, and difficulties to identify and harmonise dedicated spectrum for a pilot channel. For the specific in-band CPC, Orange believes that no specific action seems necessary.

- Database / Geolocation

Orange considers that the implementation of a database combined with geolocation systems could be an alternative solution to provide necessary information about spectrum availability and associated technical conditions to the cognitive radio device.

However, such a solution could only allow sharing with stable and well known spectrum usage equipment. It is not appropriate for agile systems as mentioned before.

Even if this solution seems more attractive than beacon transmission or sensing, a number of major issues should be carefully analysed before authorising its implementation.

Orange supports that access to the database as well as the format of the transmit and receive information should be based on a worldwide harmonised and standardised approach.

The Database needs to be appropriately designed, managed and correctly updated without transgressing confidentiality. Orange believes that questions about the concept of close or open databases need to be carefully understood and strongly depend on the use and the associated scenario which will be implemented. In any case, Orange is extremely concerned by the possible impact of the third party management of the database. In addition, several key usages are based on indoor

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deployment where geo-location based on satellite services cannot be used to correctly evaluate position.

5. Proposed modification to be included in the final Report on Cognitive Technology

To facilitate the acceptance of the Orange's proposed modifications, a specific template for changes request covering category of modification, as well as the associated section and the proposed change has been developed.

- Change Request #1

Section	Executive summary		Page	3
Category	Correction			☑
	Addition of feature			
	Functional modification of feature			
	Editorial modification			
Reason for change	Orange believes that Cognitive Radio term should not be limited to opportunistic spectrum. Instead, Orange supports modifications in the final RSPG report to clarify the possible uses of cognitive elements for future communications			
Summary of change	Orange proposes the following sentences: The typical focus, at the moment, of the use of cognitive radio technologies is on opportunistic spectrum access whereby Cognitive Radios (CR), for example, could identify "unused" portions of spectrum and share that spectrum without interfering with the existing users. Furthermore, other deployment scenarios such as the use of CRS technology by an operator of a radiocommunication service to improve the management of its assigned spectrum resource, are currently under development too.			

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- Change Request #2

Section	Index	Page	5
Category	Correction		
	Addition of feature		☑
	Functional modification of feature		
	Editorial modification		
Reason for change	Orange believes that Cognitive Radio term should not be limited to opportunistic spectrum. Instead, Orange supports modifications in the final RSPG report to clarify the possible uses of cognitive elements for future communications		
Summary of change	Orange supports the addition of the sub-section 4.4 titled "Deployment scenarios" and which should summarise overview of the possible use.		

- Change Request #3

Section	Index	Page	5
Category	Correction		
	Addition of feature		☑
	Functional modification of feature		
	Editorial modification		
Reason for change	Orange believes that activity outside Europe should not be limited to USA and current status in Canada should be developed.		
Summary of change	Orange supports the modification of the sub-section 6.2 to include in broader manner the activity in other part of the world. Orange proposes the following title: "Activity outside Europe".		

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■ Change Request #4

Section	Scope of the report	Page	7
Category	Correction		
	Addition of feature		
	Functional modification of feature		
	Editorial modification		☑
Reason for change	Orange believes that the main benefit of the cognitive radio technologies is to improve the efficiency in the overall spectrum use.		
Summary of change	In order to avoid any mis-interpretation, Orange supports the modification of the sentence dedicated to the "spectrum efficiency". Orange proposes the following sentence: Cognitive radio technologies are expected to be a key driver of innovation, resulting in more efficient use of spectrum and having the potential to offer considerable benefits across a broad range of applications. Devices using cognitive technologies may allow for real-time spectrum management and are capable of increasing <u>the efficient use of the overall spectrum</u>. One current case study on cognitive technologies is in the use of so-called 'white spaces' in the UHF band. Europe should engage in these discussions in order to facilitate access, <u>while respecting the access conditions fot the primary allocated services,</u> to the spectrum and to promote innovation.		

■ Change Request #5

Section	Basic concepts and terminology	Page	8
Category	Correction		☑
	Addition of feature		
	Functional modification of feature		
	Editorial modification		
Reason for	Orange believes that the functionalities which allow service delivery in		

change	a radio cognitive environment is the system and not the radio itself as mentioned in page 8.
Summary of change	Orange proposes the following sentence: The focus of the cognitive radio system proposed by Mitola, was to deliver the service the user wants based on "a priori" knowledge and reasoning. Since then the focus of research on cognitive radio has shifted towards spectrum sensing and dynamic spectrum access.

▪ Change Request #6

Section	Overview on Cognitive Radio Technology	Page	8
Category	Correction		☑
	Addition of feature		
	Functional modification of feature		
	Editorial modification		
Reason for change	Orange believes that Cognitive Radio term should not be limited to opportunistic spectrum. Instead, Orange supports modifications in the final RSPG report to clarify the possible uses of cognitive elements for future communications		
Summary of change	Orange proposes the following sentences: The typical focus, at the moment, of the use of cognitive radio technologies is on opportunistic spectrum access whereby Cognitive Radios (CR), for example, could identify "unused" portions of spectrum and share that spectrum without interfering with the existing users. Furthermore, other deployment scenarios such as the use of CRS technology by an operator of a radiocommunication service to improve the management of its assigned spectrum resource, are currently under development too.		

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- Change Request #7

Section	5.4.3 / Software Defined Radio	Page	15
Category	Correction		☑
	Addition of feature		
	Functional modification of feature		
	Editorial modification		
Reason for change	Orange considers that the share of responsibilities has to be clearly identified for SDR (addressed in section 5.4.3) as well as for pure CRT devices.		
Summary of change	The following text can be found in Section 5.4.3: Intrinsically, CRT devices do not lead to other issues of responsibility than is the case for non CRT devices, as long as all the sharing situations potentially resulting from cognitive capabilities have been studied and are duly taken into account. CRT functionality can even help overcome…. Orange proposes to modify the text as follows: In theory, CRT devices should not lead to new issues relating to responsibility compared with the case of non-CRT devices, as long as all the sharing situations potentially resulting from cognitive capabilities have been studied and are duly taken into account. However, it has to be pointed out that there a clear difference between the responsibilities accepted typically by the manufacturers of IT equipment and of « radio » equipment. In the case of interferrence, the users and the radio manufacturers bear a hudge responsibility. Should interferrence be caused by equipment or information provided by the IT sector, the responsibility has to be shared between the various stakeholders. So far, licences issued by the IT industry to their customers, show that these companies are nor ready to accept any responsibility of any kind. This could no longer be acceptable. On the other hand, CRT functionality could even help overcome …		

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- Change Request #8

Section	Horizontal sharing	Page	15
Category	Correction		☑
	Addition of feature		
	Functional modification of feature		
	Editorial modification		
Reason for change	Orange considers that horizontal sharing should not be exclusively centralised to a spectrum broker entity. Bi-lateral or multi-lateral agreements could be appropriate to achieve efficient horizontal sharing under specific deployment scenarios.		
Summary of change	Orange would like to propose the following sentence: A central entity (a spectrum broker) or a multi-lateral agreement could be used to facilitate this form of "flexible rights of use" or any other solutions agreed by the parties and endorsed by regulation "under the regulatory framework". In this case, the regulator will need to define the minimum technical conditions for the relevant blocks of spectrum pool within which cognitive radio users will operate.		

- Change Request #9

Section	Cognitive Pilot Channel	Page	17
Category	Correction		
	Addition of feature		
	Functional modification of feature		
	Editorial modification		☑
Reason for change	Orange considers that Cognitive Pilot Channel (both in-band and out-band) have been heavily studied in the research project E3 and conclusion, especially on the business aspects should be developed in the section 5.4.2 based on the E3 deliverables.		
Summary of change	Orange supports both additional of newly developed elements studied in the E3 project and appropriate references link to this project.		

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▪ Change Request #10

Section	Software Defined Radio	Page	18
Category	Correction		
	Addition of feature		
	Functional modification of feature		☑
	Editorial modification		
Reason for change	Orange believes that Software Defined Radio (SDR) will be a technical enabler for the implementation of cognitive radio systems, even if it is not mandatory. The security aspects as well as the regulation in force in Europe and the responsibility issue should be carefully studied and developed in the section dedicated to SDR.		
Summary of change	Orange supports: - addition of a specific sub-section detailing the security and the sharing responsibility aspects. - addition of a paragraph summarising the key modifications of the regulation to offer appropriate European regulatory framework.		

▪ Change Request #11

Section	Regulatory framework and (initial) business plan	Page	21
Category	Correction		
	Addition of feature		
	Functional modification of feature		
	Editorial modification		☑
Reason for change	Orange considers that "new spectrum" terminology should be avoid in the RSPG report.		
Summary of change	Orange would like to delete "and facilitating access to new spectrum3, in the second sentence of the sub-section 8.2.		

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- Change Request #12

Section	Regulatory framework and (initial) business plan	Page	21
Category	Correction		
	Addition of feature		☑
	Functional modification of feature		
	Editorial modification		
Reason for change	Orange, as a present user, would like to request some clarification on the following sentences: "Any major changes in the frequency usage are expected to meet some resistance from present users. Consultation between spectrum managers and these users will be part of a process of giving the confidence that they need in the regulatory framework of CR. A related issue that may need to addressed is the different levels of quality of service that need to be guaranteed. Industry is therefore invited to provide such information, where considered appropriate. At this stage, there is a common European interest in establishing some form of partnership between European standardisation bodies and spectrum regulators (e.g. through CEPT), where possible, on the basis of initial business plans from industry."		
Summary of change	Orange notes that resistance for some changes could be due to the fact potential interferences might be under estimated. It would beneficial to add information on the (in-band and adjacent band) interference management.		