IEEE 802.19.1a
Wireless Coexistence

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| CID163 resolution: Text proposal on the priority based coexistence management |
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Abstract

This contribution provides text proposals for priority based coexistence management based on 802.19.1 standard and approved text.

1. Entity operation
	1. CDIS operation
		* 1. **Obtaining coexistence set information**

*Revise the table of* ***listOfOperatingFrequencies*** *as follows*

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***freqRankIndex*** | ***INTEGER*** | Shall be set to indicate priority index of *frequencyRange* in this table if available. |
| ***frequencyRange*** | ***FrequencyRange*** | Shall be set to indicate operating frequency range. ~~Operating frequency range~~ |
| ***txPower*** | ***REAL*** | Shall be set to indicate the transmission power of the GCO in ***frequencyRange***. |
| ***resolutionBandwidth*** | ***REAL*** | Shall be set to indicate the resolution bandwidth of available frequency where GCO is operating, if applicable.  |
| ***typeOfOperatingFrequency*** | ***TypeOfFrequency*** | Shall be set to indicate the frequency type if the regulatory specifies. |
| ***occupancy*** | ***REAL*** | Optionally present. If present, this parameter shall be set to indicate occupancy of the GCO frequency range. |
| ***energyDetectionInfo*** | ***EnergyDetectionInfo*** | Optionally present. If present, this parameter shall be set to indicate energy detection information. |
| ***modulationParameters*** | ***ModulationParameters*** | Shall be set to indicate modulation parameters. |
| ***sicDemodulationProcedure*** | ***SICDemodulationProcedure*** | Optionally present. If present, this parameter shall be set to indicate SIC demodulation procedures to be configured as shown in 7.2.2.13. |
| ***coChGCOLimit*** | ***CoChGCOLimit*** | Limit on the maximum number of co-channel GCOs that shall operate simultaneously within a given region and frequency |

* 1. CM operation
		1. Profile 3
			1. **~~WSO~~GCO registration**

*Revise the table of* ***listOfOperatingFrequencies*** *as follows*

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***freqRankIndex*** | ***INTEGER*** | Shall be set to indicate priority index of *frequencyRange* in this table if available. |
| ***frequencyRange*** | ***FrequencyRange*** | Shall be set to indicate operating frequency range. ~~Operating frequency range~~ |
| ***txPower*** | ***REAL*** | Shall be set to indicate the transmission power of the GCO in ***frequencyRange***. |
| ***resolutionBandwidth*** | ***REAL*** | Shall be set to indicate the resolution bandwidth of available frequency where GCO is operating, if applicable.  |
| ***typeOfOperatingFrequency*** | ***TypeOfFrequency*** | Shall be set to indicate the frequency type if the regulatory specifies. |
| ***occupancy*** | ***REAL*** | Optionally present. If present, this parameter shall be set to indicate occupancy of the ~~WSO~~GCO frequency range. |
| ***energyDetectionInfo*** | ***EnergyDetectionInfo*** | Optionally present. If present, this parameter shall be set to indicate energy detection information. |
| ***modulationParameters*** | ***ModulationParameters*** | Shall be set to indicate modulation parameters. |
| ***sicDemodulationProcedure*** | ***SICDemodulationProcedure*** | Optionally present. If present, this parameter shall be set to indicate SIC demodulation procedures to be configured as shown in 7.2.2.13. |
| ***coChGCOLimit*** | ***CoChGCOLimit*** | Limit on the maximum number of co-channel GCOs that shall operate simultaneously within a given region and frequency |

* 1. CE operation
		1. Profile 3
			1. ~~WSO~~GCO reconfiguration

*Revise the table of* ***listOfOperatingFrequencies*** *as follows*

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***freqRankIndex*** | ***INTEGER*** | Shall be set to indicate priority index of *frequencyRange* in this table if available. |
| ***frequencyRange*** | ***FrequencyRange*** | Shall be set to indicate operating frequency range. ~~Operating frequency range~~ |
| ***txPower*** | ***REAL*** | Shall be set to indicate the transmission power of the GCO in ***frequencyRange***. |
| ***resolutionBandwidth*** | ***REAL*** | Shall be set to indicate the resolution bandwidth of available frequency where GCO is operating, if applicable.  |
| ***typeOfOperatingFrequency*** | ***TypeOfFrequency*** | Shall be set to indicate the frequency type if the regulatory specifies. |
| ***occupancy*** | ***REAL*** | Optionally present. If present, this parameter shall be set to indicate occupancy of the ~~WSO~~GCO frequency range. |
| ***energyDetectionInfo*** | ***EnergyDetectionInfo*** | Optionally present. If present, this parameter shall be set to indicate energy detection information. |
| ***modulationParameters*** | ***ModulationParameters*** | Shall be set to indicate modulation parameters. |
| ***sicDemodulationProcedure*** | ***SICDemodulationProcedure*** | Optionally present. If present, this parameter shall be set to indicate SIC demodulation procedures to be configured as shown in 7.2.2.13. |
| ***intLeakageFactor*** | ***REAL*** | Optionally present. If present, this parameter shall be set to indicate interference leakage weighting factor. The details are shown in 7.2.2.12. |
| ***listOfSpecUsageInfoOfRefPoints*** | ***ListOfSpecUsageInfo*** | Optionally present. If present, this parameter shall be set to indicate the list of reference point locations. The details are shown in 7.2.2.14. |
| ***listOfSpecUsageInfoOfNeightborGCOs*** | ***ListOfSpecUsageInfo*** | Optionally present. If present, this parameter shall be set to indicate the list of co-channel neighbor GCOs location. The details are shown in 7.2.2.15. |
| ***coChGCOLimit*** | ***CoChGCOLimit*** | Limit on the maximum number of co-channel GCOs that shall operate simultaneously within a given region and frequency |

7 Coexistence mechanisms and algorithms

* 1. Coexistence algorithms
		1. Coexistence decision algorithms

***Insert the following text***

7.2.2.x Algorithm for priority based coexistence management

7.2.2.x.1 Introduction

The operational frequencies to be used by a new entrant GCO is determined according to the frequency usage pattern of existing GCO under the constraint of reducing harmful interference to higher priority GCOs as much as possible. Depending on which frequency is assigned to GCOs, different impact is made to current system performance of GCOs as well as the subsequent frequency assignment. It would bring out an overall benefit if the distribution variety of the frequencies in use is taken into account in selecting operational frequency from the available frequencies. This raises the need to design fine-grained resource allocation scheme, which introduces the need of subdividing available frequencies considering the prospective impact of their usage to the system capacity.

This algorithm presents a fine-grained resource allocation solution that ranks frequencies to be used for a certain GCO according to prospective impact of their usage to higher priority GCOs. The metric of interest in the algorithm is the interference incurred to higher priority GCOs when the frequency is used by the target GCO with a pre-assumed power level. In particular, when the low interference is prospectively caused to higher priority GCOs on a certain available frequency, that frequency can be ranked as high priority frequency to be used by the lower priority GCO. The following subclauses give the procedure of determining the usage priority on frequencies to be used for the target GCO by CM.

7.2.2.x.2 Priority based resource allocation

The priority based resource allocation shall be initiated by CM. CM firstly obtains the information of target GCO and calculates prospective interference level, which is defined as the amount of interference that would be caused by the allocation of that particular frequency to be used by the target GCO.

An example method of calculating prospective interference levelis described as follows. CM obtains information of location of a target GCO as well as available frequencies associated to the location. For each of the available frequencies, CM identifies the interference-victim reference point. There are three methods to identify the reference point as follows.

1. Higher priority GCO that is located nearest to the target GCO.
2. To select a reference point for the group of higher priority GCOs.
3. The closest point on the expected coverage of the high priority GCO near the target GCO.

With the location of the selected reference point, CM estimates the interference caused to that location from the target GCO. Iterate previous steps, the value of prospective interference levelon every available frequency for the target GCO is estimated.

Secondly, CM determines the frequency to be used by the target GCO by ranking the available frequencies according to the value of prospective interference level. One way is to sort the frequencies to be used by the target GCO in increasing order of their value of prospective interference level. In other words, the available frequencies are sorted in descending order of usage priority of frequencies given to the target GCO. Another simplified way is to determine the ranking based on the distance between the interference-victim reference point and the target GCO. The longer the distance is, the higher usage priority on that frequency is given to the target GCO.

Thirdly, CM sends the ranking result (***freqRankIndex***) to the target GCO via CE or the other CM by indicating the ranking in the ***listOfOperatingFrequencies*** parameter.

After receiving the ranking result, the target GCO is able to select frequencies for use accordingly.

7.2.2.x.3 Algorithm description

The flowchart of the algorithm is depicted in Figure xx. The processes are as follows.

* (P#1):

P#1 is the procedure operated at the CDIS where the CDIS recieves the receiver information of the GCO through the GCO registration procedure as specified in 5.2.3.1.

* (P#2):

In this stage, CM obtains the information required for calculating prospective interference levelfor each target GCO and operates the calculation. The information shall be obtained through the GCO Registration Procedure in 5.2.2.1. When there are multiple CMs, the information shall be obtained through the Obtaining Operating Frequency Information procedure in 5.2.18 or Obtaining Operating Frequency Information procedure over Coordination Enabler in 5.2.19.

* (P#3):

 In this process, CM uses the calculation result to rank the list of frequencies to be used by the target GCO.

* (P#4):

In P#4 CM uses the 5.2.10.1 GCO Reconfigure procedure to send the ordered frequencies to the target GCO, or uses the 6.3.4.11 Sending reconfiguration request from CM to another CM to send such information to another CM.

* (P#5):

In P#5 CE sends ranking results to GCO and reports the GCOs’ selection result to CDIS via CM.



Figure xx Flowchart of priority based coexistence management

## A.2 Data types for IEEE 802.19.1a

--List of operating frequencies

ListOfOperatingFrequencies ::= SEQUENCE OF SEQUENCE{

 --Priority index of *frequencyRange*

 freqRankIndex INTEGER OPTIONAL,

--Frequency range

 frequencyRange FrequencyRange OPTIONAL,

 --Transmission power [dBm]

 txPower REAL OPTIONAL,

 --Resolution bandwidth [Hz]

 resolutionBandwidth REAL OPTIONAL,

 --Type of operating frequency

 typeOfOperatingFrequency TypeOfFrequency OPTIONAL,

 --Occupancy if known [fractional value between 0 and 1]

 occupancy REAL OPTIONAL,

 --Energy detection information

 energyDetectionInfo EnergyDetectionInfo OPTIONAL,

 --Modulation parameters

 modulationParameters ModulationParameters OPTIONAL,

 --Demodulation procedure

 sicDemodulationProcedure SICDemodulationProcedure OPTIONAL,

 --Interference leakage weighting factor

intLeakageFactor REAL OPTIONAL,

 --List of reference point locations.

listOfSpecUsageInfoOfRefPoints ListOfSpecUsageInfo OPTIONAL,

--List of co-channel neighbor GCOs location

listOfSpecUsageInfoOfNeightborGCOs ListOfSpecUsageInfo OPTIONAL,

--Co-channel GCO limit

coChGCOLimit CoChGCOLimit OPTIONAL,

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