IEEE P802.19  
Wireless Coexistence

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| A conflict handling proposal for distributed decision making | | | | |
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Abstract

This document is a submission to IEEE 802.19 TG1 about conflict handling when two CMs apply distributed decision making and consequently there is a chance for the two CMs to conduct decision making concurrently.

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The contribution shows a mechanism to solve a conflict situation of simultaneous resource allocations to the same WSO by at least two CMs that apply distributed decision making. The section contains some instructions to the technical editor to facilitate the editing work.

# 1 Text proposal for the candidate draft

*Editorial instruction: Have the following sub-section added to a correct location in section 9 and update the sub-section numbering as appropriate.*

**9.X.X Conflict handling procedure**

**9.X.X.1 Introduction**

When two CMs, or multiple of them, apply distributed decision making they may concurrently are in process of allocating resources to a same WSO. This is a conflict in a resource allocation. It is a responsibility of a CM to check whether any other CM has calculated resources concurrently to any WSOs among a target WSO and its coexistence set. The following sub-sections define the procedure to handle this kind of conflict situation.

**9.X.X.2 Conflict handling**

Upon calculating a resource allocation proposal to a WSO a CM shall transmit a conflict check request to all other CMs that are allowed to calculate resource allocations to this WSO. The request shall contain an inquiry whether the other CM is calculating resources to the WSO. The request shall indicate also the CM’s own resource allocation proposal. The other CM shall send a response of either “yes” or “no”. If the response is “yes”, the responding CM becomes a conflict handling CM. Otherwise the responding CM shall not take part to the conflict handling process and it is not allowed to calculate resources to the WSO until a certain period has expired after the solution has been communicated.

The WSO for which the CM has calculated a resource allocation proposal may be a member of the first coexistence set and not under the CM itself. In that case there may be elements in the second coexistence set of that WSO that are not in the first coexistence set. The CM shall transmit a conflict check request via a serving CM of the WSO to those CMs managing the elements in the second coexistence set that address are unknown.

Upon transmitting a request to each of the CMs that are authorized to calculate resources to the WSO and upon receiving responses from all of them, the requesting CM knows, which are the conflict handling CMs. If there is no conflict handling CM, the requesting CM shall proceed to implement the resource allocation to the WSO and shall communicate the allocation to all the relevant CMs. Otherwise the requesting CM shall wait for conflict check requests from all the conflict handling CMs. The requesting CM shall reply to each of the requests with a “yes” response like the other CMs earlier indicated that they were in the process of calculating resources to the WSO.

Upon receiving a conflict check request from each other conflict handling CM with their resource allocation proposal, the requesting CM shall perform proposal ranking. In the proposal ranking the CM shall put the proposals from the other conflict handling CMs in order by giving the highest score (e.g. 5 in case of 5 proposals) to the “best” proposal, the second highest score (e.g. 4 in case of 5 proposals) and so on. The CM shall not consider its own proposal in the ranking but shall score only proposals from the other CMs. The CM shall transmit a message with the ranking result (scores for all the proposals) to the CM that serves the WSO (i.e. serving CM) for which the allocation proposals have been ranked. The message shall indicate the number of conflict handling CMs to ensure that the service CM knows how many ranking messages to expect. Once the serving CM has received all the ranking result messages it shall determine which of the allocation proposals has received the highest total score. The serving CM may sum all the scores per proposal and use that as the total score of the proposal. The serving CM shall select the proposal that has the highest total score as the winning proposal. If there are multiple proposals with the highest total score, the CM shall pick up one of them as the winning proposal.

Upon determining the winning proposal, the serving CM shall communicate the selected allocation to the relevant CMs and to the WSO itself in the manner it would do in case without conflicts. All the CMs having their WSOs in a coexistence set of the WSO and the serving CM itself shall reset a timer to specified value. They are not allowed to make any resource allocations to the WSO until the timer has reached zero. There is an exception for the serving CM to calculate a new resource allocation, i.e. the WSO is not able to operate anymore in the allocated frequency.

*New messages:*

* *CM-to-another CM: conflict check request*
  + *Addresses of at least CM, another CM and when needed CM serving a WSO*
  + *A WSO id*
  + *Question to Another CM about is it calculating resources: yes/no*
  + *Calculated allocation to the WSO: start freq, stop freq, occupancy*
* *Another CM-to-CM: conflict check response*
  + *A WSO id*
  + *Answer of resource calculation: yes/no*
* *Conflict CM to serving CM: ranking message*
  + *Number of ranked WSOs*
  + *Ranking list: a sequence of “WSO\_id rankingNumber”*