IEEE P802.19  
Wireless Coexistence

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CM operation for profile N | | | | |
| Date: 2013-05-15 | | | | |
| Author(s): | | | | |
| Name | Company | Address | Phone | email |
| Stanislav Filin | NICT |  |  | sfilin@nict.go.jp |
| Hiroshi Harada | NICT |  |  |  |

Abstract

This document is a submission to IEEE 802.19 TG1 proposing CM operation for profile N.

**Notice:** This document has been prepared to assist IEEE 802.19. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

# Proposed update

*It is proposed to add CM Operation for Profile N using the text below.*

# CM operation

# Profile N

# General description

Figures below show general operation of a CM.





After start up, the CM shall connect to a CDIS and shall enter the waiting state marked by label A in the Figures above.

If the CM has received a subscription request from a CE, then the CM shall perform the WSO subscription or subscription update procedure and shall update WSO information. If the received subscription request indicates change in the coexistence service for one or several already registered WSOs, the CM shall perform sharing coexistence set element information procedure.

Then, if the received subscription request indicates change from information service to management service for one or several already registered WSOs, the CM shall switch to state C. Otherwise, the CM shall return to the waiting state.

If the CM has received a CE registration request from a CE, then the CM shall perform the WSO registration or registration update procedure and shall update WSO information. If the received CE registration request indicates change in the operating frequency of one or several already registered WSOs, the CM shall perform providing coexistence report procedure and shall perform sharing coexistence set element information procedure.

Then, if the received CE registration request indicates change in the operating frequency of one or several already registered WSOs subscribed to information service, the CM shall switch to state C. Otherwise, the CM shall return to the waiting state.

If the CM has received stop operation announcement from a CE, then the CM shall perform the CE stop operation procedure, shall update WSO information, and shall perform WSO registration update procedure. After that, the CM shall return to the waiting state.

If the CM has received stop operation announcement from its serving CDIS, then the CM shall perform the CDIS stop operation procedure and shall check whether it has been last available CDIS. If it has been last available CDIS, the CM shall perform the CM stop operation procedure and shall stop operation. If at least one other CDIS is available, the CM shall connect to the new CDIS and perform WSO registration procedure. After that, the CM shall return to the waiting state.

If the CM has received a coexistence set element information request, then the CM shall perform the obtaining coexistence set element information procedure. After that, the CM shall return to the waiting state.

If the CM has received a request to stop operation, then the CM shall perform the CM stop operation procedure and shall stop operation.

If the CM has received a coexistence set information announcement, then the CM shall perform the providing coexistence set information procedure, shall perform obtaining coexistence set element information procedure, shall update WSO information, and shall switch to state C.

If the CM has received a coexistence set element information announcement, then the CM shall perform the sharing coexistence set element information procedure, shall update WSO information, shall update WSO information, and shall switch to state C.

In state C, the CM shall run coexistence decision making algorithm 1a. If based on the result of the coexistence decision making algorithm there is a need in neighbor WSO reconfiguration, the CM shall perform the coexistence set element reconfiguration procedure and shall update the WSO information. Then the CM shall check whether any of the coexistence set element reconfiguration requests it has sent has been rejected. If at least one coexistence set element reconfiguration request has been rejected, the CM shall run coexistence decision making algorithm 1b. Then, the CM shall switch to state D.

If the CM has received a coexistence set element reconfiguration request, then the CM shall perform the coexistence set element reconfiguration procedure (including running coexistence decision making algorithm 2) and shall check whether the WSO reconfiguration is needed. If the WSO reconfiguration is not needed, the CM shall return to the waiting state. If the WSO reconfiguration is needed, the CM shall switch to state D.

In state D, the CM shall perform the WSO reconfiguration procedure, shall update WSO information, shall perform the providing coexistence report procedure, and shall perform the sharing coexistence set element information procedure. After that, the CM shall return to the waiting state.

If none of the above has happened, the CM shall return to the waiting state.

# WSO information

The CM shall maintain up to date at least the following information about CEs and WSOs it serves and neighbor CMs, CEs, and WSOs.

-- WSO information

WSOInformation ::= SEQUENCE {

--List of subject CEs

listOfSubjectCEs SEQUENCE OF SEQUENCE {

--Subject CE ID

subjectCEID CxID,

--Subject CE coexistence service

subjectCECoexistenceService CoexistenceService,

--List of subject WSOs

listOfSubjectWSOs SEQUENCE OF SEQUENCE {

--Subject WSO ID

subjectWSOID OCTET STRING,

--Subject WSO network technology

subjectWSONetworkTechnology NetworkTechnology,

--Subject WSO geolocation

subjectWSOGeolocation Geolocation,

--Subject WSO coverage area (if known)

subjectWSOCoverageArea CoverageArea OPTIONAL,

--Subject WSO installation parameters (if known)

subjectWSOInstallationParameters InstallationParameters OPTIONAL,

--Subject WSO list of operating frequencies (if operating)

subjectWSOListOfOperatingFrequencies ListOfOperatingFrequencies OPTIONAL,

--Subject WSO list of available frequencies

subjectWSOListOfAvailableFrequencies SEQUENCE OF SEQUENCE {

--Frequency range of the available frequency

availableFrequencyRange FrequencyRange,

--List of neighbor CMs

listOfNeighborCMs SEQUENCE OF SEQUENCE {

--Neighbor CM ID

neighborCMID CxID,

--List of neighbor CEs

listOfNeighborCEs SEQUENCE OF SEQUENCE {

--Neighbor CE ID

neighborCEID CxID,

--List of neighbor WSOs

listOfNeighborWSOs SEQUENCE OF SEQUENCE {

--Neighbor WSO ID

neighborWSOID OCTET STRING,

--Neighbor WSO coexistence service

neighborWSOCoexistenceService CoexistenceService,

--Neighbor WSO network technology

neighborWSONetworkTechnology NetworkTechnology,

--Interference direction

interferenceDirection InterferenceDirection,

--Distance to the subject WSO

distanceToSubjectWSO REAL,

--Neighbor WSO list of available frequencies

neighborWSOListOfAvailableFrequencies ListOfAvailableFrequencies,

--Neighbor WSO list of operating frequencies (if operating)

neighborWSOListOfOperatingFrequencies ListOfOperatingFrequencies

OPTIONAL

}

}

}

}

}

},

--List of neighbor CMs transport information

listOfNeigborCMsTransport ListOfNeighborCMsTransport

}

# CM operation after receiving a subscription request from a CE

If the CM has received a subscription request from a CE, then the CM shall perform the WSO subscription or subscription update procedure and shall update WSO information.

If the received subscription request indicates change in the coexistence service for one or several already registered WSOs, the CM shall perform sharing coexistence set element information procedure.

Then, if the received subscription request indicates change from information service to management service for one or several already registered WSOs, the CM shall switch to state C. Otherwise, the CM shall return to the waiting state.

# WSO subscription / subscription update procedure

After the CM has received the ***SubscriptionRequest*** message from a CE, the CM shall perform the **WSO subscription or subscription update procedure**, described in (reference).

Table below shows expected values of the parameters in the ***SubscriptionRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***subscriptionRequest*** |

Table below shows expected values of the parameters of the each element of the sequence in the ***subscriptionRequest*** payload. The number of elements shall be equal to one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***clientID*** | ***IA5String*** | The value of the ***clientID*** parameter from the CM configuration file. |
| ***clientPassword*** | ***IA5String*** | The value of the ***clientPassword*** parameter from the CM configuration file. |
| ***coexistenceService*** | ***CoexistenceService*** | One of the allowed values of the ***coexistenceService*** parameter from the CM configuration file associated with the values of the received ***clientID*** and ***clientPassword*** parameters. |

After the CM has received the ***SubscriptionRequest*** message from the CE, the CM shall generate and send the ***SubscriptionResponse*** message to the CE.

When generating the ***SubscriptionResponse*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***subscriptionResponse*** |

The CM shall set the parameters of the ***subscriptionResponse*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***serverID*** | ***IA5String*** | The value of the ***serverID*** parameter from the CM configuration file. |
| ***serverPassword*** | ***IA5String*** | The value of the ***serverPassword*** parameter from the CM configuration file. |
| ***status*** | ***Status*** | ***noError***, if subscription is successful. |

# Updating WSO information

After the CM has sent the ***SubscriptionResponse*** message, the CM shall update the ***WSOInformation***.

The CM shall check whether the CE that has sent the ***SubscriptionRequest*** message is already in the ***listOfSubjectCEs*** parameter of the ***WSOInformation***.

If the CE is in the ***listOfSubjectCEs*** parameter of the ***WSOInformation***, the CM shall set the value of the ***subjectCECoexistenceService*** parameter of this CE to the value of the ***coexistenceService*** parameter in the received ***SubscriptionResponse*** message.

If the CE is not in the ***listOfSubjectCEs*** parameter of the ***WSOInformation***, the CM shall create new element in the ***listOfSubjectCEs*** parameter. Then the CM shall set the value of the ***subjectCEID*** parameter of the new element to the CE ID of this CE and shall set the value of the ***subjectCECoexistenceService*** parameter of this CE to the value of the ***coexistenceService*** parameter in the received ***SubscriptionResponse*** message.

# Sharing coexistence set element information procedure

After the CM has updated the ***WSOInformation***, the CM shall check whether the CE that has sent the ***SubscriptionRequest*** message has already one or several WSOs registered.

If the CE has already one or several WSOs registered, the CM shall check whether the value of the ***subjectCECoexistenceService*** parameter of this CE has changed during updating the ***WSOInformation***.

If it has changed, the CM shall perform the **sharing coexistence set element information procedure**, described in (reference).

The CM shall generate and send one or several ***CoexistenceSetElementInformationAnnouncement*** messages to one or several neighbor CMs. The number of messages is equal to the number of CMs listed in the ***subjectWSOListOfAvailableFrequencies*** parameter under the WSOs registered under the CE which ***subjectCECoexistenceService*** parameter has been changed in the ***WSOInformation***.

When generating a ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationAnnouncement*** |

The CM shall set the parameters of the each element of the sequence of the ***coexistenceSetElementInformationAnnouncement*** payload as shown in the table below. The number of the elements shall be one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the CE which ***subjectCECoexistenceService*** parameter has been changed. |
| ***coexistenceService*** | ***CoexistenceService*** | The value of the ***subjectCECoexistenceService*** parameter of the CE. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | This parameter is not used. |

After the CM has generated a ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall send this message to a corresponding CM and shall wait for the ***CoexistenceSetElementInformationConfirm*** message.

Table below shows expected values of the parameters in the ***CoexistenceSetElementInformationConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationConfirm*** |

Table below shows expected values of the parameters in the ***coexistenceSetElementInformationConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

# CM operation after receiving a CE registration request

If the CM has received a CE registration request from a CE, then the CM shall perform the WSO registration or registration update procedure and shall update WSO information.

If the received CE registration request indicates change in the operating frequency of one or several already registered WSOs, the CM shall perform providing coexistence report procedure and shall perform sharing coexistence set element information procedure.

Then, if the received CE registration request indicates change in the operating frequency of one or several already registered WSOs subscribed to information service, the CM shall switch to state C. Otherwise, the CM shall return to the waiting state.

# WSO registration / registration update procedure

After the CM has received the ***CEregistrationRequest*** message from a CE, the CM shall perform the **WSO registration or registration update procedure**, described in (reference).

Table below shows expected values of the parameters in the ***CERegistrationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***ceRegistrationRequest*** |

Table below shows expected values of the parameters of the each element of the sequence in the ***ceRegistrationRequest*** payload. The number of elements may be one or several depending on the number of WSOs being registered.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***operationCode*** | ***OperationCode*** | Indicates whether this is new registration, registration update, or deregistration. |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***networkID*** | ***OCTET STRING*** | *This parameter is not used.* |
| ***netowrkTechnology*** | ***NetworkTechnology*** | WSO network technology (this parameter is used only for new registration). |
| ***geolocation*** | ***Geolocation*** | WSO location described using ***coordinate*** parameter value (this parameter is used only for new registration). |
| ***coverageArea*** | ***CoverageArea*** | If this is new registration and the WSO coverage area is known, then this parameter is used (see table below). Otherwise, this parameter is not used. |
| ***installationParameters*** | ***InstallationParameters*** | If this is new registration and the WSO installation parameters are known, then this parameter is used (see table below). Otherwise, this parameter is not used. |
| ***listOfQAvailableFrequencies*** | ***ListOfQAvailableFrequencies*** | This parameter is used for new registration and may be used for the registration update (see table below). |
| ***txScheduleSupported*** | ***BOOLEAN*** | *This parameter is not used.* |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | This parameter may be used for new registration and may be used for the registration update (see table below). |
| ***requiredResource*** | ***RequiredResource*** | *This parameter is not used.* |

Table below shows expected values of the parameters of the ***coverageArea*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***radius*** | ***REAL*** | Radius of the coverage area. |
| ***refFrequency*** | ***REAL*** | Reference frequency for which the radius is calculated. |
| ***refMasterHeight*** | ***REAL*** | Reference height of the master station for which the radius is calculated. |
| ***refSlaveHeight*** | ***REAL*** | Reference height of the slave station for which the radius is calculated. |
| ***refTxPower*** | ***REAL*** | Reference transmission power for which the radius is calculated. |

Table below shows expected values of the parameters of the ***installationParameters*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***opMasterHeight*** | ***REAL*** | Height of the master station. |
| ***opSlaveHeight*** | ***REAL*** | Height of the slave station. |
| ***opTxPower*** | ***REAL*** | Transmission power (minimum of the master and slave stations). |

Table below shows expected values of the each element of the sequence in the ***listOfAvailableFrequencies*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the available frequency. |
| ***txPowerLimit*** | ***REAL*** | *This parameter is not used.* |
| ***availableStartTime*** | ***GeneralizedTime*** | *This parameter is not used.* |
| ***availableDuration*** | ***REAL*** | *This parameter is not used.* |

Table below shows expected values of the each element of the sequence in the ***listOfOpratingFrequencies*** parameter. The number of elements shall be one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the operating frequency. |
| ***occupancy*** | ***REAL*** | *This parameter is not used.* |

After the CM has received the ***CERegistrationRequest*** message from the CE, the CM shall generate and send the ***RegistrationResponse*** message to the CE.

When generating the ***RegistrationResponse*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***registrationResponse*** |

The CM shall set the parameters of the ***registrationResponse*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

After the CM has sent the ***RegistrationResponse*** message to the CE, the CM shall generate and send the ***CMRegistrationRequest*** message to the CDIS.

When generating the ***CMRegistrationRequest*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***cmRegistrationRequest*** |

The CM shall set the parameters of the ***cmRegistrationRequest*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmRegistration*** | ***CMRegistration*** | This parameter is used only in the first ***CMRegistrationRequest*** message from the CM. It is not used for the consequent ***CMRegistrationRequest*** messages from the CM. When this parameter is used it contains CM transport address (see table below). |
| ***ceRegistration*** | ***CERegistration*** | Registration information of the WSOs (see table below). |

The CM shall set the parameters of the ***cmRegistration*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ipAddress*** | ***OCTET STRING*** | CM IP address. |
| ***portNumber*** | ***INTEGER*** | CM port number. |

The CM shall set the parameters of the each element of the sequence in the ***ceRegistration*** parameter as shown in the table below. The number of the elements shall be equal to one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfWSORegistration*** | ***ListOfWSORegistration*** | List of WSOs with their registration information (see table below). |

The CM shall set the parameters of the each element of the sequence in the ***listOfWSORegistration*** parameter as shown in the table below. The number of the elements shall be equal to the number of the elements in the received ***CERegistrationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***operationCode*** | ***OperationCode*** | The value of the ***operationCode*** parameter in the received ***CERegistrationRequest*** message. |
| ***wsoID*** | ***OCTET STRING*** | The value of the ***wsoID*** parameter in the received ***CERegistrationRequest*** message. |
| ***networkTechnology*** | ***NetworkTechnology*** | The value of the ***networkTechnology*** parameter in the received ***CERegistrationRequest*** message. |
| ***geolocation*** | ***Geolocation*** | The value of the ***geolocation*** parameter in the received ***CERegistrationRequest*** message. |
| ***coverageArea*** | ***CoverageArea*** | The value of the ***coverageArea*** parameter in the received ***CERegistrationRequest*** message. |
| ***installationParameters*** | ***InstallationParameters*** | The value of the ***installationParameters*** parameter in the received ***CERegistrationRequest*** message. |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | Modified value of the ***listOfAvailableFrequencies*** parameter in the received ***CERegistrationRequest*** message. All available frequencies received from a CE that are within one TV channel are sent to CDIS as one available frequency having start and stop frequencies equal to the TV channel start and stop frequencies. |

After the CM has sent the ***CMRegistrationRequest*** message to the CDIS, the CM shall wait for the ***RegistrationResponse*** message from the CDIS.

Table below shows expected values of the parameters in the ***RegistrationResponse*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***registrationResponse*** |

Table below shows expected values of the parameters of the r***egistrationResponse*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

# Updating WSO information

After the CM has received the ***RegistrationResponse*** message from the CDIS, the CM shall update the ***WSOInformation***.

The CM shall check the values of the ***operationCode*** parameters of the each element of the sequence in the ***CERegistrationRequest*** message.

If the value of the ***operationCode*** parameter is equal to ***delete*** for a WSO, the CM shall delete the element corresponding to this WSO from the ***listOfSubjectWSOs*** parameter in the ***WSOInformation***.

If the value of the ***operationCode*** parameter is equal to ***update*** for a WSO, the CM shall update the values of the parameters in the element corresponding to this WSO in the ***listOfSubjectWSOs*** parameter in the ***WSOInformation*** according to the values of the parameters in the received ***CERegistrationRequest*** message.

If the new value of the ***listOfAvailableFrequencies*** parameter is provided in the received ***CERegistrationRequest*** message for this WSO, the CM shall delete the current ***subjectWSOListOfAvailableFrequencies*** parameter corresponding to this WSO from the ***WSOInformation*** and shall create the new ***subjectWSOListOfAvailableFrequencies*** parameter using the received ***listOfAvailableFrequencies*** parameter. In the newly created ***subjectWSOListOfAvailableFrequencies*** parameter only the value of the ***availableFrequencyRange*** parameter shall be set, while other parameters shall be kept empty until corresponding ***CoexistenceSetInformationAnnouncement*** message is received from the CDIS.

If the new value of the ***listOfOperatingFrequencies*** parameter is provided in the received ***CERegistrationRequest*** message for this WSO, the CM shall set the value of the ***subjectWSOListOfOperatingFrequencies*** parameter for this WSO to the value of the received ***listOfOperatingFrequencies*** parameter.

If the value of the ***operationCode*** parameter is equal to ***new*** for a WSO, the CM shall create a new element corresponding to this WSO in the ***listOfSubjectWSOs*** parameter in the ***WSOInformation***.

The CM shall set the value of the ***subjectWSOID*** parameter for this WSO to the value of the received ***wsoID*** parameter.

The CM shall set the value of the ***subjectWSONetworkTechnology*** parameter for this WSO to the value of the received ***networkTechnology*** parameter.

The CM shall set the value of the ***subjectWSOGeolocation*** parameter for this WSO to the value of the received ***geolocation*** parameter.

If the ***coverageArea*** parameter is provided in the received ***CERegistrationRequest*** message for this WSO, the CM shall set the value of the ***subjectWSOCoverageArea*** parameter for this WSO to the value of the received ***coverageArea*** parameter.

If the ***installationParameters*** parameter is provided in the received ***CERegistrationRequest*** message for this WSO, the CM shall set the value of the ***subjectWSOInstallationParameters*** parameter for this WSO to the value of the received ***installationParameters*** parameter.

If the ***listOfOperatingFrequencies*** parameter is provided in the received ***CERegistrationRequest*** message for this WSO, the CM shall set the value of the ***subjectWSOListOfOperatingFrequencies*** parameter for this WSO to the value of the received ***listOfOperatingFrequencies*** parameter.

The CM shall create the new ***subjectWSOListOfAvailableFrequencies*** parameter using the received ***listOfAvailableFrequencies*** parameter. In the newly created ***subjectWSOListOfAvailableFrequencies*** parameter only the value of the ***availableFrequencyRange*** parameter shall be set, while other parameters shall be kept empty until corresponding ***CoexistenceSetInformationAnnouncement*** message is received from the CDIS.

# Providing coexistence report procedure

After the CM has updated the ***WSOInformation***, the CM shall check whether the received ***CERegistrationRequest*** message contains WSOs that are subscribed to information service, have the value of the ***operationCode*** parameter equal to ***update***, are operating, and have the new value of the ***listOfOperatingFrequencies*** parameter.

If there are such WSOs, the CM shall check for each such WSO in the ***WSOInformation*** whether it has neighbor WSOs subscribed to information service that are managed by this CM.

If there are such WSOs, the CM shall perform the **providing coexistence report procedure**, described in (reference), with the CEs serving these WSOs.

The CM shall generate and send ***CoexistenceReportAnnouncement*** messages to each such CE.

When generating a ***CoexistenceReportAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceReportAnnouncement*** |

The CM shall set the parameters of each element in the sequence of the ***coexistenceReportAnnouncement*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***listOfSubjectWSO***  ***AvailableFrequencies*** | ***ListOfSubjectWSO***  ***AvailableFrequencies*** | List of the available frequencies of the subject WSO (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfSubjectWSOAvailableFrequencies*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the available frequency. |
| ***listOfNeighborCMs*** | ***ListOfNeighborCMs*** | List of neighbor CMs on this available frequency (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfNeighborCMs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmID*** | ***CxID*** | CM ID. |
| ***listOfNeighborCEs*** | ***ListOfNeighborCEs*** | List of neighbor CEs served by this neighbor CM (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfNeighborCEs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfNeighborWSOs*** | ***ListOfNeighborWSOs*** | List of neighbor WSOs served by this neighbor CE (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfNeighborWSOs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***networkTechnology*** | ***NetworkTechnology*** | Network technology of the neighbor WSO. |
| ***interferenceDirection*** | ***InterferenceDirection*** | Interference direction between subject WSO and neighbor WSO. |
| ***distance*** | ***REAL*** | Distance between subject WSO and neighbor WSO used as a measure of interference. |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | List of operating frequencies of the neighbor WSO (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfOperatingFrequencies*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the operating frequency. |
| ***Occupancy*** | ***REAL*** | *This parameter is not used.* |

After the CM has sent a ***CoexistenceReportAnnouncement*** message to a CE, the CM shall wait for the ***CoexistenceReportConfirm*** message from the CE.

Table below shows expected values of the parameters in the ***CoexistenceReportConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceReportConfirm*** |

Table below shows expected values of the parameters of the ***coexistenceReportConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

# Sharing coexistence set element information procedure

After the CM has performed the **providing coexistence report procedure**, the CM shall check whether the received ***CERegistrationRequest*** message contains WSOs that have the value of the ***operationCode*** parameter equal to ***new*** or ***update*** and have the new value of the ***listOfOperatingFrequencies*** parameter.

If there are such WSOs, the CM shall check for each such WSO in the ***WSOInformation*** whether it has neighbor WSOs that are managed by neighbor CMs.

If there are such WSOs, the CM shall perform the **sharing coexistence set element information procedure**, described in (reference), with the neighbor CMs serving these neighbor WSOs.

The CM shall generate and send ***CoexistenceSetElementInformationAnnouncement*** message to each such CM.

When generating a ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationAnnouncement*** |

The CM shall set the parameters of the each element of the sequence of the ***coexistenceSetElementInformationAnnouncement*** payload as shown in the table below. The number of the elements shall be one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the CE that has sent the ***CERegistrationRequest*** message. |
| ***coexistenceService*** | ***CoexistenceService*** | The value of the ***subjectCECoexistenceService*** parameter of the CE. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of all subject WSOs served by this CE which operating frequency has changed and that have neighbor WSO(s) managed by this neighbor CM (see table below). |

The CM shall set the parameters of the each element of the sequence of the ***listOfNeighborCMWSOs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | ID of the subject WSO which operating frequency has changed. |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | *This parameter is not used.* |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | Operating frequency of the subject WSO which operating frequency has changed. |

After the CM has generated a ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall send this message to the corresponding CM and shall wait for the ***CoexistenceSetElementInformationConfirm*** message.

Table below shows expected values of the parameters in the ***CoexistenceSetElementInformationConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationConfirm*** |

Table below shows expected values of the parameters in the ***coexistenceSetElementInformationConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

# CM operation after receiving a stop operation announcement from a CE

If the CM has received stop operation announcement from a CE, then the CM shall perform the CE stop operation procedure, shall update WSO information, and shall perform WSO registration update procedure.

After that, the CM shall return to the waiting state.

# CE stop operation procedure

After the CM has received the ***StopOperationAnnouncement*** message from a CE, the CM shall perform the **CE stop operation procedure**, described in (reference).

Table below shows expected values of the parameters in the ***StopOperationAnnouncement*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationAnnouncement*** |

After the CM has received the ***StopOperationAnnouncement*** message from the CE, the CM shall generate and send the ***StopOperationConfirm*** message to the CE.

When generating a ***StopOperationConfirm*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationConfirm*** |

The CM shall set the parameters of the ***stopOperationConfirm*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

# Updating WSO information

After the CM has sent the ***StopOperationConfirm*** message to the CE, the CM shall delete the element corresponding to this CE from the ***listOfSubjectCEs*** parameter in the ***WSOInformation***.

# WSO registration update procedure

After the CM has updated the WSO information, the CM shall perform the **WSO registration update procedure**, described in (reference).

The CM shall generate and send the ***CMRegistrationRequest*** message to the CDIS.

When generating the ***CMRegistrationRequest*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***cmRegistrationRequest*** |

The CM shall set the parameters of the ***cmRegistrationRequest*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmRegistration*** | ***CMRegistration*** | *This parameter is not used.* |
| ***ceRegistration*** | ***CERegistration*** | Registration information of the WSOs (see table below). |

The CM shall set the parameters of the each element of the sequence in the ***ceRegistration*** parameter as shown in the table below. The number of the elements shall be equal to one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfWSORegistration*** | ***ListOfWSORegistration*** | List of WSOs with their registration information (see table below). |

The CM shall set the parameters of the each element of the sequence in the ***listOfWSORegistration*** parameter as shown in the table below. The number of the elements shall be equal to the number of the WSOs served by the CE.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***operationCode*** | ***OperationCode*** | ***delete*** |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***networkTechnology*** | ***NetworkTechnology*** | *This parameter is not used.* |
| ***geolocation*** | ***Geolocation*** | *This parameter is not used.* |
| ***coverageArea*** | ***CoverageArea*** | *This parameter is not used.* |
| ***installationParameters*** | ***InstallationParameters*** | *This parameter is not used.* |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | *This parameter is not used.* |

After the CM has sent the ***CMRegistrationRequest*** message to the CDIS, the CM shall wait for the ***RegistrationResponse*** message from the CDIS.

Table below shows expected values of the parameters in the ***RegistrationResponse*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***registrationResponse*** |

Table below shows expected values of the parameters of the r***egistrationResponse*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

# CM operation after receiving a stop operation announcement from CDIS

If the CM has received stop operation announcement from its serving CDIS, then the CM shall perform the CDIS stop operation procedure

After that the CM shall check whether it has been last available CDIS. If it has been last available CDIS, the CM shall perform the CM stop operation procedure and shall stop operation.

If at least one other CDIS is available, the CM shall connect to the new CDIS, perform WSO registration procedure, and shall return to the waiting state.

# CDIS stop operation procedure

After the CM has received the ***StopOperationAnnouncement*** message from the CDIS that serves this CM, the CM shall perform the **CDIS stop operation procedure**, described in (reference).

Table below shows expected values of the parameters in the ***StopOperationAnnouncement*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationAnnouncement*** |

After the CM has received the ***StopOperationAnnouncement*** message from the CDIS, the CM shall generate and send the ***StopOperationConfirm*** message to the CDIS.

When generating the ***StopOperationConfirm*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationConfirm*** |

The CM shall set the parameters of the ***stopOperationConfirm*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

# CM stop operation procedure

If there is no other available CDIS, the CM shall perform the **CM stop operation procedure**, described in (reference).

The CM shall generate and send ***StopOperationAnnouncement*** messages to all CEs listed in the ***listOfSubjectCEs*** parameter in the ***WSOInformation***.

When generating a ***StopOperationAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationAnnouncement*** |

After sending the ***StopOperationAnnouncement*** message to a CE, the CM shall wait for the ***StopOperationConfirm*** message from the CE.

Table below shows expected values of the parameters in the ***StopOperationConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationConfirm*** |

Table below shows expected values of the parameters of the ***stopOperationConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

After the CM has received ***StopOperationConfirm*** messages from all the CEs, the CM shall stop operation.

# WSO registration procedure

If at least one other CDIS is available, the CM shall connect to the new CDIS, and shall perform the **WSO registration procedure**, described in (reference).

The CM shall generate and send the ***CMRegistrationRequest*** message to the new CDIS.

When generating the ***CMRegistrationRequest*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***cmRegistrationRequest*** |

The CM shall set the parameters of the ***cmRegistrationRequest*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmRegistration*** | ***CMRegistration*** | CM transport address (see table below). |
| ***ceRegistration*** | ***CERegistration*** | Registration information of the WSOs (see table below). |

The CM shall set the parameters of the ***cmRegistration*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ipAddress*** | ***OCTET STRING*** | CM IP address. |
| ***portNumber*** | ***INTEGER*** | CM port number. |

The CM shall set the parameters of the each element of the sequence in the ***ceRegistration*** parameter as shown in the table below. The number of the elements shall be equal to the number of subject CEs in the ***listOfSubjectCEs*** parameter in the ***WSOInformation***.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfWSORegistration*** | ***ListOfWSORegistration*** | List of WSOs with their registration information (see table below). |

The CM shall set the parameters of the each element of the sequence in the ***listOfWSORegistration*** parameter as shown in the table below. The number of the elements shall be equal to the number of the elements in the ***listOfSubjectWSOs*** parameter for this CE in the ***WSOInformation***.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***operationCode*** | ***OperationCode*** | ***new*** |
| ***wsoID*** | ***OCTET STRING*** | The value of the ***subjectWSOID*** parameter in the ***WSOInformation***. |
| ***networkTechnology*** | ***NetworkTechnology*** | The value of the ***subjectWSONetowrkTechnology*** parameter in the ***WSOInformation***. |
| ***geolocation*** | ***Geolocation*** | The value of the ***subjectWSOGeolocation*** parameter in the ***WSOInformation***. |
| ***coverageArea*** | ***CoverageArea*** | The value of the ***subjectWSOCoverageArea*** parameter in the ***WSOInformation***. |
| ***installationParameters*** | ***InstallationParameters*** | The value of the ***subjectWSOInstallationParameters*** parameter in the ***WSOInformation***. |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | Modified value of the ***listOfAvailableFrequencies*** parameter in the received ***WSOInformation*** message. All available frequencies received from a CE that are within one TV channel are sent to CDIS as one available frequency having start and stop frequencies equal to the TV channel start and stop frequencies. |

After the CM has sent the ***CMRegistrationRequest*** message to the CDIS, the CM shall wait for the ***RegistrationResponse*** message from the CDIS.

Table below shows expected values of the parameters in the ***RegistrationResponse*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***registrationResponse*** |

Table below shows expected values of the parameters of the r***egistrationResponse*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

# CM operation after receiving a coexistence set element information request

If the CM has received a coexistence set element information request, then the CM shall perform the obtaining coexistence set element information procedure.

After that, the CM shall return to the waiting state.

# Obtaining coexistence set element infromation procedure

After the CM has received the ***CoexistenceSetElementInformationRequest*** message, the CM shall perform the **Obtaining coexistence set element information procedure**, described in (reference).

Table below shows expected values of the parameters in the ***CoexistenceSetElementInformationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationRequest*** |

Table below shows expected values of the parameters of each element of the sequence in the ***coexistenceSetElementInformationRequest*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the CE which information is requested. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of WSOs served by this CE which information is requested (see table below). |

Table below shows expected values of the parameters of each element of the sequence in the ***listOfNeighborCMWSOs*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID of the WSO which information is requested. |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | *This parameter is not used.* |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | *This parameter is not used.* |

After the CM has received the ***CoexistenceSetElementInformationRequest*** message from the neighbor CM, the CM shall generate and send the ***CoexistenceSetElementInformationResponse*** message to this neighbor CM.

When generating the ***CoexistenceSetElementInformationResponse*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationResponse*** |

The CM shall set the values of the parameters of each element in the sequence of the ***coexistenceSetElementInformationResponse*** payload as shown in the table below. The number of the elements shall be equal to the number of the elements in the sequence in the received ***coexistenceSetElementInformationRequest*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the CE in the received ***CoexistenceSetElementInformationRequest*** message. |
| ***coexistenceService*** | ***CoexistenceService*** | The value of the ***subjectCECoexistenceService*** parameter for this CE in the ***WSOInformation***. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of WSOs served by this CE which information is requested (see table below). |

The CM shall set the values of the parameters of each element in the sequence of the ***listOfNeighborCMWSOs*** payload as shown in the table below. The number of the elements shall be equal to the number of the elements in the corresponding sequence in the ***listOfNeighborCMWSOs*** parameter in the received ***CoexistenceSetElementInformationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID of the WSO which information is requested. |
| ***listOfAvailable***  ***Frequencies*** | ***ListOfAvailable***  ***Frequencies*** | The value of the ***subjectWSOListOfAvailableFrequencies*** parameter for this WSO in the ***WSOInformation***. |
| ***listOfOperating***  ***Frequencies*** | ***ListOfOperating***  ***Frequencies*** | The value of the ***subjectWSOListOfOperatingFrequencies*** parameter for this WSO in the ***WSOInformation***. |

# CM operation after receiving a request to stop operation

If the CM has received a request to stop operation, then the CM shall perform the CM stop operation procedure and shall stop operation.

# CM stop operation procedure

After the CM has received the request to stop operation, the CM shall perform the **CM stop operation procedure**, described in (reference).

The CM shall generate and send ***StopOperationAnnouncement*** messages to all CEs listed in the ***listOfSubjectCEs*** parameter in the ***WSOInformation***.

When generating a ***StopOperationAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationAnnouncement*** |

After sending the ***StopOperationAnnouncement*** message to a CE, the CM shall wait for the ***StopOperationConfirm*** message from the CE.

Table below shows expected values of the parameters in the ***StopOperationConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***stopOperationConfirm*** |

Table below shows expected values of the parameters of the ***stopOperationConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

After the CM has received ***StopOperationConfirm*** messages from all the CEs, the CM shall stop operation.

# CM operation after receiving a coexistence set information announcement

If the CM has received a coexistence set information announcement, then the CM shall perform the providing coexistence set information procedure, shall perform obtaining coexistence set element information procedure, shall update WSO information, and shall switch to state C.

# Providing coexistence set information procedure

After the CM has received the ***CoexistenceSetInformationAnnouncement*** message, the CM shall perform the **providing coexistence set information procedure**, described in (reference).

Table below shows expected values of the parameters in the ***CoexistenceSetInformationAnnouncement*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetInformationAnnouncement*** |

Table below shows expected values of the parameters of each element of the sequence in the ***coexistenceSetElementInformationRequest*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***listOfSubjectCEs*** | ***ListOfSubjectCEs*** | Coexistence set information for the WSOs (see table below). |
| ***listOfNeighborCMsTransport*** | ***ListOfNeighborCMsTransport*** | List of neighbor CMs transport information mentioned inside the list of subject CEs (see table below). |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfSubjectCEs*** parameter as shown in the table below. The number of the elements shall be equal to the number of CEs serving WSOs which coexistence set information has been changed.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfSubjectWSOs*** | ***ListOfSubjectWSOs*** | List of WSOs which coexistence set information has been changed served by this CE (see table below). |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfSubjectWSOs*** parameter as shown in the table below. The number of the elements shall be equal to the number of WSOs served by a CE which coexistence set information has been changed.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***listOfSubjectWSO***  ***AvailableFrequencies*** | ***ListOfSubjectWSO***  ***AvailableFrequencies*** | List of available frequencies of the subject WSO (see table below). |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfSubjectWSOAvailableFrequencies*** parameter as shown in the table below. The number of the elements shall be equal to the number of available frequencies of a WSO.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the available frequency. |
| ***listOfNeighborCMs*** | ***ListOfNeighborCMs*** | List of neighbor CMs on this available frequency (see table below). |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfNeighborCMs*** parameter as shown in the table below. The number of the elements shall be equal to the number of neighbor CMs that serves WSOs that are neighbors to the subject WSO on this available frequency.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmID*** | ***CxID*** | CM ID. |
| ***listOfNeighborCEs*** | ***ListOfNeighborCEs*** | List of neighbor CEs served by this CM (see table below). |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfNeighborCEs*** parameter as shown in the table below. The number of the elements shall be equal to the number of neighbor CEs served by the CM.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfNeighborWSOs*** | ***ListOfNeighborWSOs*** | List of neighbor WSOs served by this CE (see table below). |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfNeighborWSOs*** parameter as shown in the table below. The number of the elements shall be equal to the number of neighbor WSOs served by the CE.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***networkTechnology*** | ***NetworkTechnology*** | Network technology of the neighbor WSO. |
| ***interferenceDirection*** | ***InterferenceDicrection*** | Interference direction among subject WSO and neighbor WSO. |
| ***distance*** | ***REAL*** | Distance between subject WSO and neighbor WSO used as a measure of interference. |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | *This parameter is not used.* |

Table below shows expected values of the parameters of the each element of the sequence in the ***listOfNeighborCMsTransport*** parameter as shown in the table below. The number of the elements shall be equal to the number of the CMs in the ***listOfNeighborCMs*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmID*** | ***CxID*** | CM ID. |
| ***ipAddress*** | ***OCTET STRING*** | CM IP address. |
| ***portNumber*** | ***INTEGER*** | CM port number. |

After the CM has received the ***CoexistenceSetInformationAnnouncement*** message, the CM shall generate and send the ***CoexistenceSetInformationConfirm*** message to the CDIS.

When generating the ***CoexistenceSetInformationConfirm*** message, the CM shall set the values of the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetInformationConfirm*** |

The CM shall set the values of the parameters in the ***coexistenceSetInformationConfirm*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

# Obtaining coexistence set element information procedure

After the CM has sent the ***CoexistenceSetInformationConfirm*** message, the CM shall perform the **obtaining coexistence set element information procedure**, described in (reference).

The CM shall generate one or several ***CoexistenceSetElementInformationRequest*** messages and send them to the corresponding neighbor CMs. The number of the ***CoexistenceSetElementInformationRequest*** messages shall be equal to the number of neighbor CMs mentioned in the ***CoexistenceSetInformationAnnouncement*** message received from the CDIS.

When generating a ***CoexistenceSetElementInformationRequest*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationRequest*** |

The CM shall set the values of the parameters of each element of the sequence in the ***coexistenceSetElementInformationRequest*** payload. The number of the elements shall be equal to the number of neighbor CEs served by the neighbor CM, mentioned in the ***CoexistenceSetInformationAnnouncement*** message received from the CDIS.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the CE which information is requested. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of WSOs served by this CE which information is requested (see table below). |

The CM shall set the values of the parameters of each element of the sequence in the ***listOfNeighborCMWSOs*** parameter as shown in the table below. The number of the elements shall be equal to the number of neighbor WSOs served by the neighbor CE, mentioned in the ***CoexistenceSetInformationAnnouncement*** message received from the CDIS.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID of the WSO which information is requested. |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | *This parameter is not used.* |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | *This parameter is not used.* |

After the CM has sent the ***CoexistenceSetElementInformationRequest*** message to the neighbor CM, the CM shall wait for the ***CoexistenceSetElementInformationResponse*** message to this neighbor CM.

Table below shows expected values of the parameters of the ***CxMessage*** of the ***CoexistenceSetElementInformationResponse*** message from the neighbor CM.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationResponse*** |

Table below shows expected values of the parameters of each element in the sequence of the ***coexistenceSetElementInformationResponse*** payload. The number of the elements shall be equal to the number of the elements in the sequence in the sent ***CoexistenceSetElementInformationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the CE in the sent ***CoexistenceSetElementInformationRequest*** message. |
| ***coexistenceService*** | ***CoexistenceService*** | Coexistence service of this CE. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of WSOs served by this CE which information is requested (see table below). |

Table below shows the expected values of the parameters of each element in the sequence of the ***listOfNeighborCMWSOs*** payload. The number of the elements shall be equal to the number of the elements in the corresponding sequence in the sent ***CoexistenceSetElementInformationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID of the WSO which information is requested. |
| ***listOfAvailable***  ***Frequencies*** | ***ListOfAvailable***  ***Frequencies*** | List of available frequencies of this WSO. |
| ***listOfOperating***  ***Frequencies*** | ***ListOfOperating***  ***Frequencies*** | List of operating frequencies of this WSO. |

# Updating WSO information

After the CM has received the ***CoexistenceSetElementInformationResponse*** messages from all neighbor CMs, the CM shall update the ***WSOInformation***.

For each subject CE and subject WSO mentioned in the ***ceID*** and ***wsoID*** parameters in the ***CoexistenceSetInformationAnnouncement*** message received from the CDIS, for each subject WSO available frequency of such subject WSO the CM shall create new ***listOfNeighborCMs*** parameter in the ***WSOInformation*** using the ***listOfNeighborCMs*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message. If the value of one ***frequencyRange*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message covers several ***availableFrequencyRange*** parameters in the ***WSOInformation***, the CM shall create identical ***listOfNeighborCMs*** parameters in each of the ***availableFrequencyRange*** parameters.

For each element of the newly created ***listOfNeighborCMs*** parameter in the ***WSOInformation***, the CM shall set the value of the ***neighborCMID*** parameter to the value of the corresponding ***cmID*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message and shall create the new ***listOfNeighborCEs*** parameter using the ***listOfNeighborCEs*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message.

For each element of the newly created ***listOfNeighborCEs*** parameter in the ***WSOInformation***, the CM shall set the value of the ***neighborCEID*** parameter to the value of the corresponding ***ceID*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message and shall create the new ***listOfNeighborWSOs*** parameter using the ***listOfNeighborWSOs*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message.

For each element of the newly created ***listOfNeighborWSOs*** parameter in the ***WSOInformation***, the CM shall set the value of the ***neighborWSOID***, ***neighborWSONetworkTechnology***, ***interferenceDirection***, and ***distanceToSubjectWSO*** parameters to the values of the corresponding ***wsoID***, ***networkTechnology***, ***interferenceDirection***, and distance parameters in the received ***CoexistenceSetInformationAnnouncement*** message.

For each element of the ***listOfNeighborCMsTransport*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message, the CM shall check whether this neighbor CM is already in the ***listOfNeighborCMsTransport*** parameter in the ***WSOInformation***. If this neighbor CM is already in the ***WSOInformation***, the CM shall update its IP address and port number based on the parameters in the received ***CoexistenceSetInformationAnnouncement*** message if needed. If this neighbor CM is not in the ***WSOInformation***, the CM shall create a new element in the ***listOfNeighborCMsTransport*** parameter in the ***WSOInformation*** and set the values of the ***cmID***, ***ipAddress***, and ***portNumber*** parameters in the ***WSOInformation*** to the corresponding values in the ***listOfNeighborCMsTransport*** parameter in the received ***CoexistenceSetInformationAnnouncement*** message.

For each neighbor CE and neighbor WSO mentioned in the ***ceID*** and ***wsoID*** parameters in the ***CoexistenceSetElementInformationResponse*** message received from a neighbor CM, the CM shall update all elements in the ***WSOInformation*** corresponding to such neighbor CE and neighbor WSO as follows. The CM shall set the values of the ***neighborWSOCoexistenceService***, ***neighborWSOListOfAvailableFrequencies***, and ***neighborWSOListOfOperatingFrequencies*** parameters to the values of the corresponding ***coexistenceService***, ***listOfAvailableFrequencies***, and ***listOfOperatingFrequencies*** parameters in the received ***CoexistenceSetElementInformationResponse*** message.

# CM operation after receiving a coexistence set element information announcement

If the CM has received a coexistence set element information announcement, then the CM shall perform the sharing coexistence set element information procedure, shall update WSO information, shall update WSO information, and shall switch to state C.

# Sharing coexistence set element information procedure

After the CM has received the ***CoexistenceSetElementInformationAnnouncement*** message from a neighbor CM, the CM shall perform the **sharing coexistence set element information procedure**, described in (reference).

Table below shows expected values of the parameters of the ***CxMessage*** in the received ***CoexistenceSetElementInformationAnnouncement*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationAnnouncement*** |

Table below shows expected values of the parameters of each element in the sequence of the ***coexistenceSetElementInformationAnnouncement*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID of the neighbor CE. |
| ***coexistenceService*** | ***CoexistenceService*** | Coexistence service of the neighbor CE. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of neighbor WSOs served by this neighbor CE (see table below). |

Table below shows the expected values of the parameters of each element in the sequence of the ***listOfNeighborCMWSOs*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID of the neighbor WSO. |
| ***listOfAvailable***  ***Frequencies*** | ***ListOfAvailable***  ***Frequencies*** | List of available frequencies of the neighbor WSO. This parameter is not always used. |
| ***listOfOperating***  ***Frequencies*** | ***ListOfOperating***  ***Frequencies*** | List of operating frequencies of the neighbor WSO. This parameter is not always used. |

After the CM has received the ***CoexistenceSetElementInformationAnnouncement*** message from the neighbor CM, the CM shall generate and send the ***CoexistenceSetElementInformationConfirm*** message to the neighbor CM

When generating the ***CoexistenceSetElementInformationConfirm*** message the CM shall set the values of the parameters in the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationConfirm*** |

The CM shall set the values of the parameters of the ***coexistenceSetElementInformationConfirm*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |

# Updating WSO information

After the CM has sent the ***CoexistenceSetElementInformationConfirm*** messages to the neighbor CM, the CM shall update the ***WSOInformation***.

For each neighbor CE and neighbor WSO mentioned in the ***ceID*** and ***wsoID*** parameters in the ***CoexistenceSetElementInformationAnnouncement*** message received from the neighbor CM, the CM shall update all elements in the ***WSOInformation*** corresponding to such neighbor CE and neighbor WSO as follows.

The CM shall set the value of the ***neighborWSOCoexistenceService*** parameter to the value of the corresponding ***coexistenceService*** parameter in the received ***CoexistenceSetElementInformationAnnouncement*** message.

If the ***listOfAvailableFrequencies*** and ***listOfOperatingFrequencies*** parameters are provided in the ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall set the values of the ***neighborWSOListOfAvailableFrequencies*** and ***neighborWSOListOfOperatingFrequencies*** parameters to the values of the corresponding ***listOfAvailableFrequencies*** and ***listOfOperatingFrequencies*** parameters in the received ***CoexistenceSetElementInformationAnnouncement*** message.

# CM operation in state C

In state C, the CM shall run coexistence decision making algorithm 1a.

If based on the result of the coexistence decision making algorithm there is a need in neighbor WSO reconfiguration, the CM shall perform the coexistence set element reconfiguration procedure.

Then the CM shall check whether any of the coexistence set element reconfiguration requests it has sent has been rejected. If at least one coexistence set element reconfiguration request has been rejected, the Cm shall run coexistence decision making algorithm 1b.

Then, the CM shall switch to state D.

# Coexistence set element reconfiguration procedure

After the CM has run the coexistence decision making algorithm 1a as described in Annex B: Coexistence decision making algorithm, the CM shall check whether there is a need to reconfigure one or several neighbor WSOs. If there is such need, the CM shall perform the **coexistence set element reconfiguration procedure** described in (reference).

The CM shall generate one or several ***CoexistenceSetElementReconfigurationRequest*** messages and shall send them to one or several neighbor CMs. The number of messages shall be equal to the number of neighbor CMs serving neighbor WSOs which reconfiguration is needed.

When generating a ***CoexistenceSetElementReconfigurationRequest*** message the CM shall set the values of the parameters in the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementReconfigurationRequest*** |

The CM shall set the values of the parameters of the ***coexistenceSetElementReconfigurationRequest*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***reconfigListOfSubjectCEs*** | ***ReconfigListOfCEs*** | List of subject CEs that serve WSOs that are subscribed to management service and are neighbors to the neighbor WSOs that are needed to be reconfigured (see table below). |
| ***reconfigListOfNeighborCEs*** | ***ReconfigListOfCEs*** | List of neighbor CEs that serve neighbor WSOs that are needed to be reconfigured (see table below). |

The CM shall set the values of the parameters of each element in the sequence of the ***reconfigListOfSubjectCEs*** parameter as shown in the table below. The number of the elements shall be equal to the number of the subject CEs that serve WSOs that are subscribed to management service and are neighbors to the neighbor WSOs that are needed to be reconfigured.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | Subject CE ID. |
| ***reconfigListOfWSOs*** | ***ReconfigListOfWSOs*** | List of subject WSOs (see table below). |

The CM shall set the values of the parameters of each element in the sequence of the ***reconfigListOfWSOs*** parameter as shown in the table below. The number of the elements shall be equal to the number of the subject WSOs served by the CE that are subscribed to management service and are neighbors to the neighbor WSOs that are needed to be reconfigured.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | Subject WSO ID. |
| ***newOperatingFrequency*** | ***FrequencyRange*** | Potential new operating frequency. |

The CM shall set the values of the parameters of each element in the sequence of the ***reconfigListOfNeighborCEs*** parameter as shown in the table below. The number of the elements shall be equal to the number of the neighbor CEs that serve WSOs that are needed to be reconfigured.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | Neighbor CE ID. |
| ***reconfigListOfWSOs*** | ***ReconfigListOfWSOs*** | List of neighbor WSOs (see table below). |

The CM shall set the values of the parameters of each element in the sequence of the ***reconfigListOfWSOs*** parameter as shown in the table below. The number of the elements shall be equal to the number of the neighbor WSOs served by the neighbor CE that are needed to be reconfigured.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | Neighbor WSO ID. |
| ***newOperatingFrequency*** | ***FrequencyRange*** | Proposed new operating frequency. |

After the CM has sent the ***CoexistenceSetElementReconfigurationRequest*** message, the CM shall wait for the ***CoexistenceSetElementReconfigurationResponse*** message.

Table below shows expected values of the parameters in the ***CxMessage*** of the ***CoexistenceSetElementReconfigurationResponse*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementReconfigurationResponse*** |

Table below shows expected values of the parameters in the ***coexistenceSetElementReconfigurationResponse*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***requestIsAccepted*** | ***BOOLEAN*** | ***true*** if all the proposed new operating frequencies are accepted, otherwise ***false***. |

# Updating WSO information

After the CM has received all ***CoexistenceSetElementReconfigurationResponse*** messages from all neighbor CMs, the CM shall update the ***WSOInformation***.

For each ***CoexistenceSetElementReconfigurationResponse*** message that has the value of the requestIsAccepted parameter equeal to true, the CM shall take all pairs of the ***ceID*** and ***wsoID*** parameters from the corresponding ***CoexistenceSetElementReconfigurationRequest*** message and set the values of their ***neighborWSOListOfOperatingFrequencies*** parameters in the ***WSOInformation*** to the values of the corresponding ***newOperatingFrequency*** parameters in the ***CoexistenceSetElementReconfigurationRequest*** message.

# CM operation after receiving a coexistence set element reconfiguration request

If the CM has received a coexistence set element reconfiguration request, then the CM shall perform the coexistence set element reconfiguration procedure (including running coexistence decision making algorithm 2) and shall check whether the WSO reconfiguration is needed.

If the WSO reconfiguration is not needed, the CM shall return to the waiting state.

If the subject WSO reconfiguration is needed, the CM shall switch to state D.

# Coexistence set element reconfiguration procedure

After the CM has received the ***CoexistenceSetElementReconfigurationRequest*** message, the CM shall run the **coexistence set element reconfiguration procedure**, described in (reference).

Table below shows expected values of the parameters in the ***CxMessage*** in the ***CoexistenceSetElementReconfigurationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementReconfigurationRequest*** |

Table below shows expected values of the parameters in the ***coexistenceSetElementReconfigurationRequest*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***reconfigListOfSubjectCEs*** | ***ReconfigListOfCEs*** | List of subject CEs that serve WSOs that are subscribed to management service and are neighbors to the neighbor WSOs that are needed to be reconfigured (see table below). |
| ***reconfigListOfNeighborCEs*** | ***ReconfigListOfCEs*** | List of neighbor CEs that serve neighbor WSOs that are needed to be reconfigured (see table below). |

Table below shows expected values of the parameters of each element in the sequence of the ***reconfigListOfSubjectCEs*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | Subject CE ID. |
| ***reconfigListOfWSOs*** | ***ReconfigListOfWSOs*** | List of subject WSOs (see table below). |

Table below shows expected values of the parameters of each element in the sequence of the ***reconfigListOfWSOs*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | Subject WSO ID. |
| ***newOperatingFrequency*** | ***FrequencyRange*** | Potential new operating frequency. |

Table below shows the expected values of the parameters of each element in the sequence of the ***reconfigListOfNeighborCEs*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | Neighbor CE ID. |
| ***reconfigListOfWSOs*** | ***ReconfigListOfWSOs*** | List of neighbor WSOs (see table below). |

Table below shows the expected values of the parameters of each element in the sequence of the ***reconfigListOfWSOs*** parameter.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | Neighbor WSO ID. |
| ***newOperatingFrequency*** | ***FrequencyRange*** | Proposed new operating frequency. |

After the CM has received the ***CoexistenceSetElementReconfigurationRequest*** message, the CM shall run the coexistence decision making algorithm 2, described in Annex B: Coexistence decision making algorithms.

Then, the CM shall generate and send the ***CoexistenceSetElementReconfigurationResponse*** message to the neighbor CM that has sent the ***CoexistenceSetElementReconfigurationRequest*** message.

When generating the ***CoexistenceSetElementReconfigurationResponse*** message, the CM shall set the values of the parameters in the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementReconfigurationResponse*** |

The CM shall set the values of the parameters in the ***coexistenceSetElementReconfigurationResponse*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***requestIsAccepted*** | ***BOOLEAN*** | ***true*** if the proposed new operating frequencies are acceptable, ***false*** otherwise. |

# CM operation in state D

In state D, the CM shall perform the WSO reconfiguration procedure, shall update WSO information, shall perform the providing coexistence report procedure, and shall perform the sharing coexistence set element information procedure.

After that, the CM shall return to the waiting state.

# WSO reconfiguration procedure

In state D, the CM shall perform the **WSO reconfiguration procedure**, described in (reference).

The CM shall generate one or several ***ReconfigurationRequest*** messages and send them to the corresponding subject CEs. The number of messages shall be equal to the number of the subject CEs serving subject WSOs that require reconfiguration based on the results of the coexistence decision making algorithm 1b or 2.

When generating a ***ReconfigurationRequest*** message, the CM shall set the values of the parameters of the CxMessage as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***reconfigurationRequest*** |

The CM shall set the values of the parameters of each element in the sequence in the ***reconfigurationRequest*** payload as shown in the table below. The number of the elements shall be equal to the number of WSOs served by the CE that require reconfiguration.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | ID of a WSO that requires reconfiguration. |
| ***operatingFrequency*** | ***FrequencyRange*** | New operating frequency if available |
| ***txPowerLimit*** | ***REAL*** | *This parameter is not used.* |
| ***channelIsShared*** | ***BOOLEAN*** | *This parameter is not used.* |
| ***txSchedule*** | ***TxSchedule*** | *This parameter is not used.* |
| ***noOperatingFrequency*** | ***BOOLEAN*** | This parameter is set to ***true***, if there is no available operating frequency, otherwise, this parameter is not used. |

After the CM has sent the ***ReconfigurationRequest*** message, the CM shall wait for the ***ReconfigurationResponse*** message from the CE.

Table below shows expected values of the parameters of the ***CxMessage*** in the ***ReconfigurationResponse*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***reconfigurationResponse*** |

Table below shows the values of the parameters of each element in the sequence in the ***reconfigurationResponse*** payload. The number of the elements shall be equal to the number of the elements in the sent ***ReconfigurationRequest*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***status*** | ***Status*** | ***noError*** |

# Updating WSO information

After the CM has received all ***ReconfigurationResponse*** messages from all CEs, the CM shall update the ***WSOInformation***.

For each subject CE and subject WSO that has been reconfigured by the WSO reconfiguration procedure, the CM shall set the value of the ***subjectWSOListOfOperatingFrequencies*** parameter in the ***WSOInformation*** to the value of the ***operatingFrequency*** parameter in the corresponding sent ***ReconfigurationRequest*** message.

# Providing coexistence report procedure

After the CM has updated the ***WSOInformation***, the CM shall check whether the updated ***WSOInformation*** contains subject WSOs that are subscribed to the information service, are operating, and have neighbor subject WSOs which operating frequency has been changed.

If there are such WSOs, the CM shall perform the **providing coexistence report procedure**, described in (reference), with the CEs serving these WSOs.

The CM shall generate and send ***CoexistenceReportAnnouncement*** messages to each such CE.

When generating a ***CoexistenceReportAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceReportAnnouncement*** |

The CM shall set the parameters of each element in the sequence of the ***coexistenceReportAnnouncement*** payload as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***listOfSubjectWSO***  ***AvailableFrequencies*** | ***ListOfSubjectWSO***  ***AvailableFrequencies*** | List of the available frequencies of the subject WSO (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfSubjectWSOAvailableFrequencies*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the available frequency. |
| ***listOfNeighborCMs*** | ***ListOfNeighborCMs*** | List of neighbor CMs on this available frequency (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfNeighborCMs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***cmID*** | ***CxID*** | CM ID. |
| ***listOfNeighborCEs*** | ***ListOfNeighborCEs*** | List of neighbor CEs served by this neighbor CM (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfNeighborCEs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | CE ID. |
| ***listOfNeighborWSOs*** | ***ListOfNeighborWSOs*** | List of neighbor WSOs served by this neighbor CE (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfNeighborWSOs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | WSO ID. |
| ***networkTechnology*** | ***NetworkTechnology*** | Network technology of the neighbor WSO. |
| ***interferenceDirection*** | ***InterferenceDirection*** | Interference direction between subject WSO and neighbor WSO. |
| ***distance*** | ***REAL*** | Distance between subject WSO and neighbor WSO used as a measure of interference. |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | List of operating frequencies of the neighbor WSO (see table below). |

The CM shall set the value of each element in the sequence of the ***listOfOperatingFrequencies*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***frequencyRange*** | ***FrequencyRange*** | Frequency range of the operating frequency. |
| ***Occupancy*** | ***REAL*** | *This parameter is not used.* |

After the CM has sent a ***CoexistenceReportAnnouncement*** message to a CE, the CM shall wait for the ***CoexistenceReportConfirm*** message from the CE.

Table below shows expected values of the parameters in the ***CoexistenceReportConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceReportConfirm*** |

Table below shows expected values of the parameters of the ***coexistenceReportConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Staus*** | ***noError*** |

# Sharing coexistence set element information procedure

After the CM has performed the **providing coexistence report procedure**, the CM shall check whether the updated ***WSOInformation*** contains WSOs which operating frequency has been changed and which have neighbor WSOs served by neighbor CMs.

If there are such WSOs, the CM shall perform the **sharing coexistence set element information procedure**, described in (reference), with the neighbor CMs serving these neighbor WSOs.

The CM shall generate and send ***CoexistenceSetElementInformationAnnouncement*** message to each such CM.

When generating a ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall set the parameters of the ***CxMessage*** as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationAnnouncement*** |

The CM shall set the parameters of the each element of the sequence of the ***coexistenceSetElementInformationAnnouncement*** payload as shown in the table below. The number of the elements shall be one.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***ceID*** | ***CxID*** | Subject CE ID. |
| ***coexistenceService*** | ***CoexistenceService*** | The value of the ***subjectCECoexistenceService*** parameter of the CE. |
| ***listOfNeighborCMWSOs*** | ***ListOfNeighborCMWSOs*** | List of all subject WSOs served by this CE which operating frequency has changed and that have neighbor WSO(s) managed by this neighbor CM (see table below). |

The CM shall set the parameters of the each element of the sequence of the ***listOfNeighborCMWSOs*** parameter as shown in the table below.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***wsoID*** | ***OCTET STRING*** | ID of the subject WSO which operating frequency has changed. |
| ***listOfAvailableFrequencies*** | ***ListOfAvailableFrequencies*** | *This parameter is not used.* |
| ***listOfOperatingFrequencies*** | ***ListOfOperatingFrequencies*** | Operating frequency of the subject WSO which operating frequency has changed. |

After the CM has generated a ***CoexistenceSetElementInformationAnnouncement*** message, the CM shall send this message to the corresponding CM and shall wait for the ***CoexistenceSetElementInformationConfirm*** message.

Table below shows expected values of the parameters in the ***CoexistenceSetElementInformationConfirm*** message.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***header*** | ***CxHeader*** | ***requestID*** |
| ***payload*** | ***CxPayload*** | ***coexistenceSetElementInformationConfirm*** |

Table below shows expected values of the parameters in the ***coexistenceSetElementInformationConfirm*** payload.

|  |  |  |
| --- | --- | --- |
| *Parameter* | *Data type* | *Value* |
| ***status*** | ***Status*** | ***noError*** |