IEEE P802.19

Wireless Coexistence Working Group

Project	IEEE 802.19 Wireless Coexistence Working Group (WG)
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5 Reference model

5.1 General description

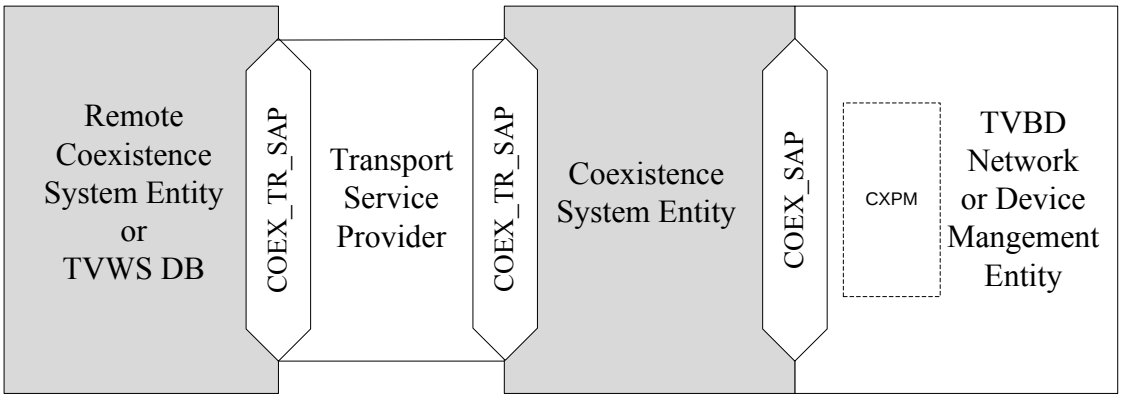

Figure 5-1 ─ Reference model of coexistence system

Figure 5-1 illustrates reference model of P802.19.1 coexistence system. P802.19.1 coexistence system entities are located on the application layer. Each 802.19.1 entity has one or more the following service access point (SAP):

—COEX_SAP (Coexistence SAP): The SAP between the coexistence system entities, e.g., CE/CM/CDIS, and the TVBD network or device management entities, e.g., 802.11 SME, 802.22 NCMS.

—CX_TR_SAP (Coexistence Transport SAP): The SAP between coexistence system entities, e.g., CE/CM/CDIS, or between coexistence system entity and TVWS DB.

TVBD network or device management entity shall provide CXPM (coexistence primitive mapping) service. CXPM converts CX_DME_SAP primitives into TVBD-specific management/control primitives. 1-to-1 mapping might be highly desirable to fully support 802.19.1 standard, but it might depend upon the degree of modification of each TVDB standard. How to implement CXPM is out of scope of this standard.

Figure 5-2 illustrates reference model of Coexistence Enabler.

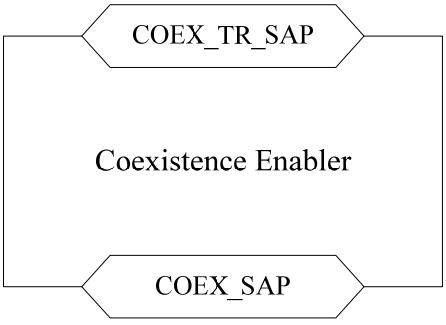

Figure 5-2 Reference model of Coexistence Enabler

Coexistence Enabler has two service access points:

— Coexistence SAP (COEX_SAP)

— Coexistence Transport SAP (COEX_TR_SAP).

Figure 5-3 illustrates reference model of Coexistence Manager and Coexistence Discovery and Information Server.

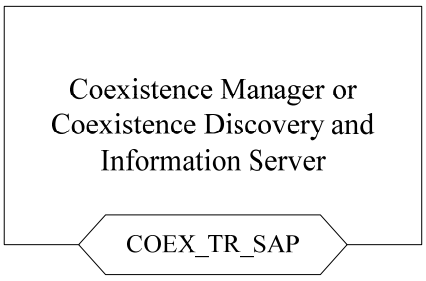

Figure 5-3 Reference model of Coexistence Manager and Coexistence Discovery and Information Server

Coexistence Manager and Coexistence Discovery and Information Server have one service access point:

— Coexistence Transport SAP (COEX_TR_SAP).

COEX_TR_SAP provides means for Coexistence Enabler, Coexistence Manager, and Coexistence Discovery and Information Server to communicate with each other and with external entities by using transport services provided by underlying layers. The underlying layers could be application layer, transport layer, network layer, and link layer. Example reference model of CE and CM describing example of using COEX_TR_SAP for interface B1 is shown in Figure 5-4.

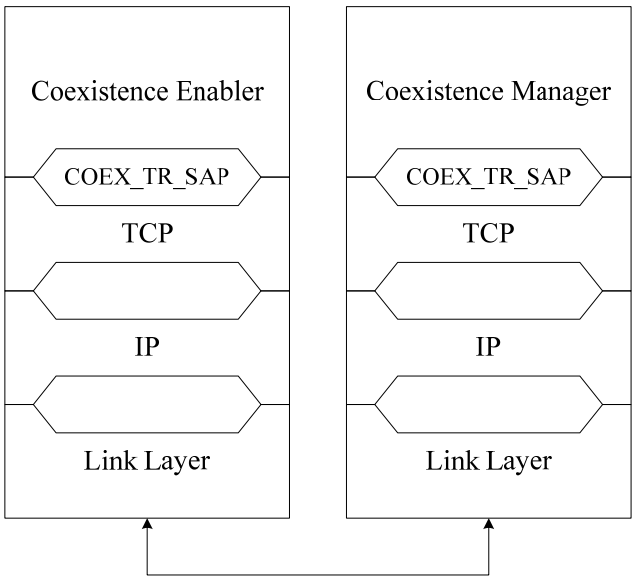

Figure 5-4 Example of using COEX_TR_SAP for interface B1

Information required for coexistence and reconfiguration commands that are exchanged between CE and CM over interface B1 are forwarded to transport layer, for example, to TCP, for transmission. This is done using COEX_TR_SAP service access point of CE and CM.

COEX_SAP defines the interface A between CE and TVBD network/device. Example reference model of interface A for an IEEE 802.16h compliant device is shown in Figure 5-5.

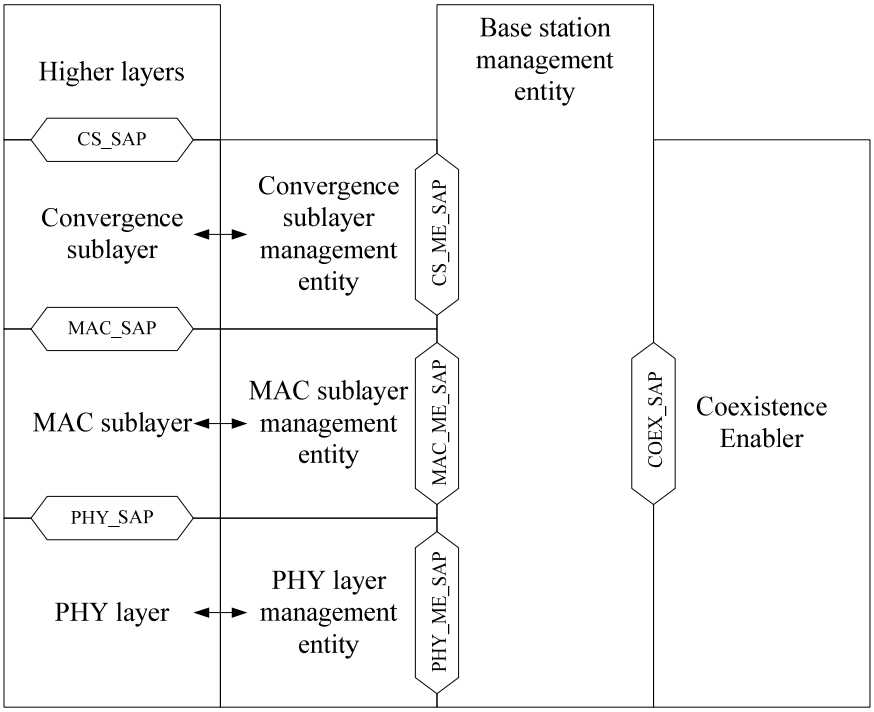

Figure 5-5 Example reference model of interface A for an IEEE 802.16h compliant device

The left side of Figure 5-5 shows typical reference model of radio interface including data, control and management planes for physical layer, MAC sublayer, and convergence sublayer. The middle part of Figure 5-5 shows base station management entity. The right part of Figure 5-5 shows CE.

Typically, radio interface is implemented in such a way that it provides management interface for base station management entity. In Figure 5-5, such interface is represented by three service access points PHY_ME_SAP, MAC_ME_SAP, and CS_ME_SAP, corresponding to physical layer, MAC sublayer, and convergence sublayer. This service access points can be used to obtain information from radio interface and to request reconfiguration of radio interface. Correspondingly, CE can use these service access points to implement interface A. Interface A is defined by service access point COEX_SAP. Communication between radio interface management service access points PHY_ME_SAP, MAC_ME_SAP, and CS_ME_SAP and CE service access point COEX_MEDIA_SAP is done via base station management entity.

Figure 5-6 illustrate an example reference model for interface A for an 802.22 compliant device. The left side of Figure 5-6 shows the reference model for 802.22 including control and management planes for conversion sublayer, MAC layer and PHY layer. The middle part of Figure 5-6 shows the network control and management system (NCMS) which allows the PHY/MAC layers specified in 802.22 standards to be independent of network architecture, the transport network, and the protocols used at the backend. Then, the 802.19.1 system in the right part of Figure 4 employs NCMS to obtain information and request reconfiguration of the 802.22 system.

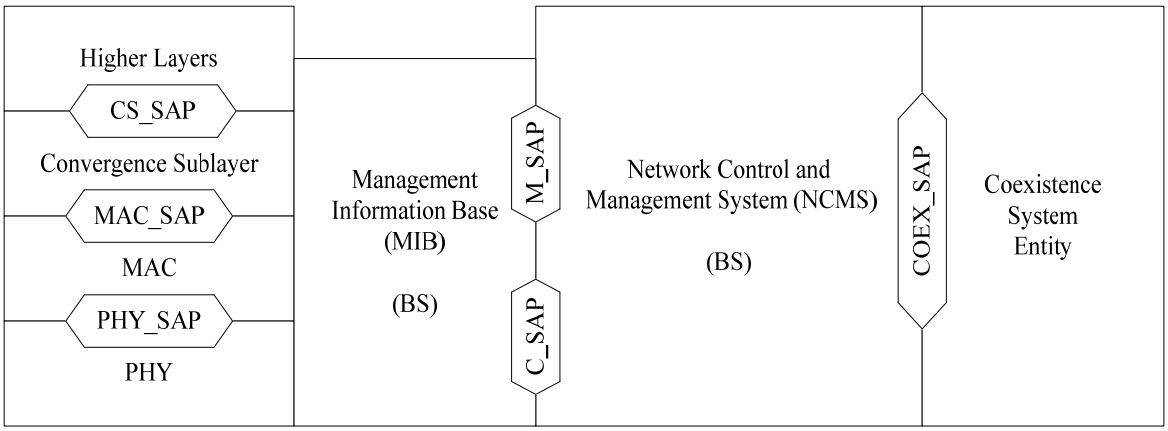

Figure 5-6 Example reference model of interface A for a 802.22 compliant device

Figure 5-7 shows an example reference model of interface A for an 802.11 compliant device. The coexistence services over IEEE 802.11 is carried either in the data frames by using existing primitives defined by the LSAP or by using primitives defined by the MAC State Generic Convergence Function (MSGCF) service access point (SAP) (MSGCF_SAP). The MSGCF has access to all management primitives and provides services to higher layers.

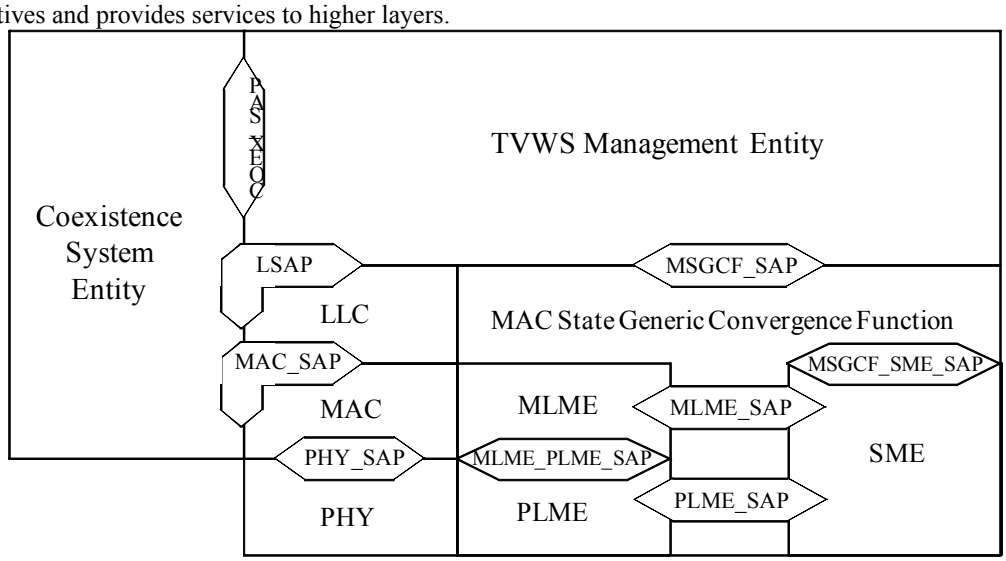

Figure 5-7 Example reference model of interface A for a 802.11 compliant device

5.2 Service access points

The SAPs are defined as a set of SAP primitives. Each primitive definition has the table of allowable parameters. Each parameter is defined using abstract data types. These types indicate the semantic value of that parameter. The parameters defined within the subclause for a particular primitive are produced or consumed by that primitive. Several of the abstract data types are used in multiple primitive definitions.

5.2.1 COEX_TR_SAP

Coexistence Transport SAP (COEX_TR_SAP) supports interface B1, B2, B3 and C providing means for Coexistence Enabler, Coexistence Manager, and Coexistence Discovery and Information Server to communicate with each other and with external entities by using transport services provided by underlying layers. COEX_TR_SAP is defined as a set of primitives that provides the following service:

— Transport service:
  — Used by CE, CM, CDIS or external entity to send coexistence protocol data unit to each other and to external entities and to receive acknowledgement of such operation
  — Used by CE, CM, and CDIS or external entity to receive coexistence protocol data unit from each other and from external entities.

Primitives described in Table 5-1 are used to define the Coexistence Transport SAP.

Table 5-1 – Coexistencre Transport SAP primitives

Primitive	Service	Description
COEX_TR_PACKET	Transport	Used by CE, CM, CDIS or external entity to send a coexistence protocol data unit using a transport service provider. Also used by a transport service provider to deliever a coexistence protocol data unit to CE, CM, CDIS or external entity.

5.2.1.1 Transport service

5.2.1.1.1 COEX_TR_PACKET

5.2.1.1.1.1 COEX_TR_PACKET.request

Function:
This primitive is used by CE, CM, CDIS or external entity to request the transport service provider to transport a coexistence protocol data unit.

Semantics:
COEX_TR_PACKET.request(
TransportPref,
SourceAddress,
DestinationAddress,
ReliableDeliveryFlag,
CXProtocolPDU
)

Name	Data Type	Description
TransportPref	TRANSPORT_PREF	Transport protocol preference.
SourceAddress	TRANSPORT_ADDR	Protocol layer specific Transport Address of the entity sending coexistence protocol data unit.
DestinationAddress	TRANSPORT_ADDR	Protocol layer specific Transport Address of the entity to receive coexistence protocol data unit.
CXProtocolPDU	OCTET_STRING	Coexistence protocol data unit to be transported.

When generated:
This primitive is generated by CE, CM, CDIS or external entity to request the transport service provider to transport a coexistence protocol data unit.

Effect on receipt:
Upon receipt of this primitive, the specific transport service provider attempts to transport the coexistence protocol data unit.

5.2.1.1.1.2 COEX_TR_PACKET.indication

Function:
This primitive is used by transport service provider to acknowledge transportation of the coexistence protocol data unit if such acknowledgment is supported by the transport service provider.

Semantics:
COEX_TR_PACKET.indication(
    TransportPref,
    SourceID,
    DestinationID,
    TransportStatus
)

Name	Data Type	Description
TransportPref	TRANSPORT_PREF	Transport protocol preference.
SourceAddress	TRANSPORT_ADDR	Protocol layer specific Transport Address of the entity sending coexistence protocol data unit.
DestinationAddress	TRANSPORT_ADDR	Protocol layer specific Transport Address of the entity to receive coexistence protocol data unit.
TransportStatus	BOOLEAN	Indicates whether the transfer of coexistence protocol data unit is successful or not.

When generated:
This primitive is generated by the transport service provider to confirm delivery of coexistence protocol data with coexistence system entity if such acknowledgement is supported by the transport service provider.

Effect on receipt:
Upon receipt of this primitive, CE, CM, CDIS or external entity receives learns about the staus of the requested delivery of coexistence protocol data.

5.2.1.1.1.3 COEX_TR_PACKET.confirm

Function:
This primitive is used by transport service provider to notify a deliver of a coexistence protocol data unit to CE, CM, CDIS or external entity.

Semantics:
CX_TP_Data.confirm (
                    TransportPref,
                    SourceAddress,
                    DestinationAddress,
                    CXProtocolPDU
)

Name	Data Type	Description
TransportPref	TRANSPORT_PREF	Transport protocol preference.
SourceID	TRANSPORT_ADDR	Protocol layer specific Transport Address of the entity sending coexistence protocol data unit.
DestinationID	TRANSPORT_ADDR	Protocol layer specific Transport Address of the entity to receive coexistence protocol data unit.
CoexProtocolPDU	OCTET_STRING	Coexistence protocol data unit to be delivered.

When generated:
Thhis primitive is generated by the transport service provider when it has coexistence protocol data unit for CE, CM, CDIS or external entity

Effect on receipt:
Upon receipt of this primitive, the CE, CM, CDIS or external entity gets coexistence protocol data unit.

5.2.2 COEX_SAP

Coexistence SAP (COEX_SAP) defines the interface A between CE and TVBD network/device. The Coexistence SAP is defined as a set of primitives that provides the following services:

- Registration service
  - Used by TVBD network/device to set up a connection with CE
  - Used by CE to obtain subscription information from TVBD network/device
  - Used by CE to obtain authentication information from TVBD network/device
  - Used by CE to obtain registration information from TVBD network/devices
- Information service:
  - Used by CE to obtain information required for coexistence from TVBD network/device
  - Used by TVBD network/device to obtain information required for coexistence from CE
  - Used by TVBD network/device to share information required for coexistence with other TVBD network/devices via the IEEE 802.19.1 system
- Measurement service:
  - Used by CE to request TVBD network/device to perform measurements required for coexistence
  - Used by CE to to obtain measurement results required for coexistence from TVBD network/device
- Reconfiguration service:
  - Used by CE to request TVBD netrwork/device to perform reconfiguration required for coexistence
- Event service:
  - Used by TVBD network/device to receive information about observed or predicted events related to coexistence from CE
  - Used by CE to receive information about observed or predicted events related to coexistence from TVBD network/device.

Primitives described in Table 1 are used to define the Coexistence SAP.

Table 5-2 ─ COEX _SAP primitives

Primitives	Services	Description
COEX_Connection	Registration	Used by TVBD to request connection with CE network/device.

COEX_Auth		Used by TVBD network/device to request authentication with CE
COEX_Reg		Used by TVBD network/device to request CE to do registration in coexistence system
COEX_CE_DREG		Used by TVBD is transmitted to CE to request de-registration of the corresponding TVBD.
COEX_TVBD_DREG		Used by CE to request de-registration of the corresponding TVBD.
COEX_DeAuth		Used by TVBD network/device to request de-authentication with CE
COEX_NeighbourList	Information	Used by CE to update the neighbour list for TVBD network/device.
COEX_AvailableChannelList		Used by CE to obtain available channel list from TVBD network/device Also used by TVBD network/device to update the list of available channels it can operate to CE.
COEX_ChannelClassification		Used by TVBD network/device to request the channel classification of the corresponding TVBD network/device.
COEX_Information		Used by CE to obtain the context information of the corresponding TVBD for coexistence. Also used by TVBD is transmitted to CE to indicate the context information change of the corresponding TVBD for coexistence.
COEX_ResourceConfigure	Reconfiguration	Used by CE to request reconfiguration of TVBD network/device required for coexistence.
COEX_Measurement	Measurement	Used by CE to request TVBD network/device to perform measurement required for coexistence and to obtain measurement results.
COEX_Event	Event	Used by TVBD network/device to inform CE about events related to coexistence observed or predicted by TVBD network/device. Also, used by CE to inform TVBD network/device about events related to coexistence observed or predicted by IEEE 802.19.1 system.

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5.2.2.1 Registration service

5.2.2.1.1 COEX_Connection

5.2.2.1.1.1 COEX_Connection.request

Function
Used by TVBD network/device to request connection with CE.
Semantics
COEX_Connection.request(
sourceID
destinationID
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request

When generated
Generated by TVBD network/device to request connection with CE.

Effect on receipt
When CE receives this primitive, the CE shall send COEX_Connection.response back to the TVBD network/device.

5.2.2.1.1.2 COEX_Connection.response

Function
Used by TVBD network/device to confirm the connection with CE.
Semantics
COEX_Connection.confirm(
sourceID
destinationID
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request

When generated
Generated by CE in response to COEX_Connection.request from TVBD network/device.
Effect on receipt
When TVBD network/device receives this primitive, it confirms the connection with CE.

5.2.2.1.2 COEX_Auth

5.2.2.1.2.1 COEX_Auth.request

Function
Used by TVBD network/device to request authentication with CE.
Semantics
COEX_Auth.request (
sourceID
destinationID
User ID
User Password
)

Name	Type	Description
Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
User ID	IA5String (ITU-T X.208)	This parameter contains User ID to be used by CE to authenticate with coexistence system.
User Password	IA5String	This parameter contains User Password to be used by CE to authenticate with coexistence system.

When generated
Generated by TVBD network/device to request authentication with CE.
Effect on receipt
When CE receives this primitive, it shall send COEX_Authentication.response back to the CE.

5.2.2.1.2.2 COEX_Auth.response

Function
Used by CE to inform TVBD network/device that the authentication is valid or not.
Semantics
COEX_Auth.response (
sourceID
destinationID
status
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
status	Status	This parameter shows that the authentication information in GetAuthInfo.response is valid or invalid status.

When generated
Generated by CE to TVBD network/device to indicate that the authentication information is valid or not.
Effect on receipt

When TVBD networks/devices receive this primitive, it shall examine authStatus.

5.2.2.1.3 COEX_Reg

5.2.2.1.3.1 COEX_Reg.request

Function
Used by TVBD network/device to request CE to do registration in coexistence system.
Semantics
COEX_Reg.request(
    sourceID
    destinationID
    networkID
    serviceType
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
networkID	NetworkID	E.g., FCC ID of TVBD network or device
serviceType	ServiceType	Discovery/Management

When generated
Generated by TVBD network/device to request CE to do registration in coexistence system.
Effect on receipt
When CE receives this primitive, it shall send COEX_Reg.response back to TVBD network/device.

5.2.2.1.3.2 COEX_Reg.response

Function
Used by CE to confirm registration stastus with TVBD network/device.
Semantics
COEX_Reg.response (
    sourceID
    destinationID
    status
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
status	STATUS	Returns the outcome of a request

When generated
Generated by CE in response to COEX_Reg.request from TVBD network/device.
Effect on receipt
When TVBD network/device receives this primitive, it examines the registration status.

5.2.2.1.4 COEX_ DeReg

5.2.2.1.4.1 COEX_ DeReg.request

Function:
Used by TVBD to request de-registration of the corresponding TVBD with CE.

Semantics:
COEX_ DeReg.request(
sourceID
destinationID
)

Name	Type	Description
SourceID	COEX_ID	This identifies a TVBD that is source of this request
DestinationID	COEX_ID	This identifies a CE that is destination of this request

When generated:
This primitive is generated by TVBD when it needs to request de-registration of the corresponding TVBD.

Effect on receipt:
When receiving this primitive from TVBD, the CE shall send the de-registration request message to CM and give the response from CM the corresponding TVBD, which indicates "Success" or "Failure" for the de-registration request of the TVBD.

5.2.2.1.4.2 COEX_ DeReg.response

Function:
Used by CE to response the de-registration request of the corresponding TVBD.

Semantics:
COEX_ DeReg.response(
sourceID
destinationID
status
)

Name	Data Type	Description
sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
status	Status	Status of de-registration • Success: De-registration of the corresponding TVBD is succeed. • Failure:De-registration of the corresponding TVBD is failed.

When generated:
This primitive is generated in response to a COEX_CE_DREG.request primitive.

Effect on receipt:

When receiving this primitive, TVBD examines the received information about the status of the de-registration request of the corresponding TVBD.

5.2.2.1.5 COEX_TVBD_DeReg

5.2.2.1.5.1 COEX_TVBD_DeReg.request

Function:
Used by CE to request de-registration of the corresponding TVBD.

Semantics:
COEX_TVBD_DeReg.request(
sourceID
destinationID
)

Parameters:

Name	Type	Description
SourceID	COEX_ID	This identifies a CE that is source of this request
DestinationID	COEX_ID	This identifies a TVBD that is destination of this request

When generated:
This primitive is generated by CE when it needs to request de-registration of the corresponding TVBD.

Effect on receipt:
When receiving this primitive from CE, the TVBD shall send the response to CE, which indicates "Success" or "Failure" for de-registration of the corresponding TVBD.

5.2.2.1.5.2 COEX_TVBD_DeReg.response

Function:
This primitive used by TVBD is transmitted to CE to give the response of de-registration of the corresponding TVBD.
Semantics:
COEX_TVBD_DeReg.response(
sourceID
destinationID
Status
)

Parameters:

Name	Data Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
status	Status	Status of de-registration • Success:De-registration of the corresponding TVBD is succeed. • Failure:De-registration of the corresponding TVBD is failed.

When generated:
This primitive is generated in response to a COEX_TVBD_DREG.request primitive.

Effect on receipt:
When receiving this primitive from TVBD, the CE shall send the response from TVBD to CM, which indicates "Success" or "Failure" for de-registration of the corresponding TVBD.

5.2.2.1.6 COEX_DeAuth

5.2.2.1.6.1 COEX_DeAuth.request

Function
Used by TVBD network/device to request de-authentication with CE.

Semantics
COEX_DeAuth.request (
sourceID
destinationID
User ID
User Password
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
User ID	IA5String (ITU-T X.208)	This parameter contains User ID to be used by CE to authenticate with coexistence system.
User Password	IA5String	This parameter contains User Password to be used by CE to authenticate with coexistence system.

When generated
Generated by TVBD network/device to request de-authentication with CE.

Effect on receipt
When CE receives this primitive, it shall send COEX_DeAuth.response back to the CE.

5.2.2.1.6.2 COEX_DeAuth.response

Function
Used by CE to inform TVBD network/device that the de-authentication is valid or not.

Semantics
COEX_DeAuth.response (
sourceID
destinationID
status
)

Name	Type	Description
sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request

status	Status	This parameter shows that the authentication information in GetAuthInfo.response is valid or invalid status.

When generated
Generated by CE to TVBD network/device to indicate whether the de-authentication is successfully processed.

Effect on receipt
When TVBD network/device receives this primitive, it shall examine status.

5.2.2.2 Information service

5.2.2.2.1 COEX_NeighbourList

5.2.2.2.1.1 COEX_NeighbourList.indication

Function
Used by CE to update the neighbour list for TVBD network/device. This primitive is only used for TVBD network/device that is subscribed to discovery service.

Semantics
COEX_Neighbourlist.indication (
    sourceID
    destinationID
    neighbourList
)

Name	Type	Description
sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
neighbourList	NeighbourList	The list of TVBD neighbours

When generated
Generated by CE to update the neighbor information for TVBD network/device.

Effect on receipt
When TVBD network/device receives this primitive, it shall update the neighbour information with the new value provided in this primitive.

5.2.2.2.2 COEX_AvailableChannelList

5.2.2.2.2.1 COEX_AvailableChannelList.request

Function
Used by CE to obtain available channel list from TVBD network/device

Semantics
COEX_AvailableChannelList.request(
    sourceID
    destinationID
)

Name	Type	Description

sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request

When generated
Generated by TVBD network/device to obtain available channel list from CE.

Effect on receipt
When TVBD network/device receives this primitive, the TVBD network/device shall send COEX_AvailableChannelList.response back to the CE.

5.2.2.2.2.2 COEX_AvailableChannelList.response

Function
Used by TVBD network/device to provide the list of available channels it can operate to CE.

Semantics
COEX_AvailableChannelList.response (
    sourceID
    destinationID
    regulatoryDomain
    availableChannelList
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
regulatoryDomain	RegulatoryDomain	The domain of regulatory of TVWS
availableChannelList	AvailableChannelList	Available channel list to operate in TVWS

When generated
Generated by TVBD network/device in response to COEX_AvailableChannelList.request from CE.

Effect on receipt
When CE receives this primitive, it examines the received information required for coexistence.

5.2.2.2.2.3 COEX_AvailableChannelList.indication

Function
Used by TVBD network/device to update the list of available channels it can operate to CE.

Semantics
COEX_AvailableChannelList.response (
    sourceID
    destinationID
    regulatoryDomain
    availableChannelList
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request

regulatoryDomain	RegulatoryDomain	The domain of regulatory of TVWS
availableChannelList	AvailableChannelList	Available channel list to operate in TVWS

When generated
Generated by TVBD network/device if information in the last COEX_AvailableChannelList.response changed.

Effect on receipt
When CE receives this primitive, it examines the received information required for coexistence.

5.2.2.2.3 COEX_ChannelClassification

5.2.2.2.3.1 COEX_ChannelClassification.request

Function:
This primitive is used by TVBD network/device to request the channel classification of the corresponding TVBD network/device.

Semantics:
Ch_Classification.request(
SourceID,
DestinationID
)

Parameters:

Name	Data Type	Description
SourceID	COEX_ID	Source identifier
DestinationID	COEX_ID	Destination identifier

When generated:
This primitive is generated by TVBD network/device when it needs to request the channel classification of the corresponding TVBD network/device.

Effect on receipt:
When receiving this primitive from TVBD network/device, the CE shall request the channel classification information of the corresponding TVBD network/device to CM.

5.2.2.2.3.2 COEX_ChannelClassification.response

Function:
This primitive used by CE is transmitted to TVBD network/device to give the channel classification information of the corresponding TVBD network/device from CM

Semantics:
Ch_Classification.response(
SourceID,
DestinationID,
ChannelClassificationList,
TxMaxPower
)

Parameters:

Name	Data Type	Description
SourceID	COEX_ID	Source identifier
DestinationID	COEX_ID	Destination identifier
ChannelClassificationList	COEX_CH_ CLASSIFICATION	Channel classification list
TxMaxPower	REAL	Maximum transmit power

When generated:
This primitive is generated in response to a Ch_Classification.request primitive.

Effect on receipt:
When receiving this primitive from CE, TVBD network/device shall employ the information for selecting operating channel of the corresponding TVBD network/device.

5.2.2.2.3.3 COEX_ChannelClassification.indication

Function:
This primitive used by CE is transmitted to TVBD to update channel classification information of the corresponding TVBD from CM.

Semantics:
Ch_Classification.response(
SourceID,
DestinationID,
ChannelClassificationList,
TxMaxPower
)

Parameters:

Name	Data Type	Description
SourceID	COEX_ID	Source identifier
DestinationID	COEX_ID	Destination identifier
ChannelClassificationList	COEX_CH_ CLASSIFICATION	Channel classification list
TxMaxPower	REAL	Maximum transmit power

When generated:
This primitive is generated to update channel classification information of the corresponding TVBD network/device.

Effect on receipt:
When TVBD network/device receives this primitive, it shall update channel classification information of the corresponding TVBD network/device.

5.2.2.2.4 COEX_Information

5.2.2.2.4.1 COEX_Information.request

Function:
This primitive is used by CE to obtain the context information of the corresponding TVBD for coexistence.

Semantics:
COEX_Information.request(
sourceID
destinationID
coexInforIDs
)

Parameters:

Name	Data Type	Description
sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
coexInforIDs	CoexInfoIDs	ID list of reported context information

When generated:
This primitive is generated by the CE when it needs to obtain the context information of the corresponding TVBD for coexistence.

Effect on receipt:
When receiving this primitive from CE, the TVBD shall give its context information the CE, which is selected by information ID list from CE.

5.2.2.2.4.2 COEX_Information.response

Function:
This primitive used by TVBD is transmitted to CE to give the context information of the corresponding TVBD for coexistence.

Semantics
COEX_Information.response (
sourceID
destinationID
coexInfoValues
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
coexInfoValues	CoexInfoValues	A set of information requests, each containing a information type and a information value

When generated:
This primitive is generated in response to a COEX_Information.request primitive.

Effect on receipt:
When receiving this primitive from TVBD network/devices, the CE shall give the context information of the corresponding TVBD the CM, which is selected by information ID list from CM.

5.2.2.2.4.3 COEX_Information.indication

Function:
This primitive used by TVBD is transmitted to CE to indicate the context information change of the corresponding TVBD for coexistence.

Semantics

COEX_Information.Indication (
sourceID
destinationID
coexInfoValues
)

Name	Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
coexInfoValues	CoexInfoValues	A set of information requests, each containing a information type and a information value

When generated:

This primitive is generated to indicate the context information change of the corresponding TVBD for coexistence..

Effect on receipt:

When receiving this primitive from TVBD network/devices, the CE shall give the context information of the corresponding TVBD the CM, which is selected by information ID list from CM.

5.2.2.3 Resource configuration service

5.2.2.3.1 COEX_ResourceConfigure

5.2.2.3.1.1 COEX_ResourceConfigure.request

Function:

Used by CE to request reconfiguration of TVBD networks/devices required for coexistence.

Semantics:

COEX_Reconfigure.request(
sourceID
destinationID
DialogToken
CoexistenceMode,
ChannelClassificationList,
ServiceStartEndTime,
ServiceCoverage,
reconfigurationRequest
CommandRequestSet
)

Parameters:

Name	Data Type	Description
sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
DialogToken	Interger	The Dialog Token to identify the command transaction.

CoexistenceMode	COEX_MODE	Coexistence mode such as • Individual channel assignment mode • Co-channel sharing mode
ChannelClassificationList	COEX_CH_CLASSIFICATION	Channel classification list
ServiceStartEndTime	COEX_SER_TIME	Service time including • Start time • End time
ServiceCoverage	REAL	Service coverage for communications
		•
reconfigurationRequest	ReconfigurationRequest	Reconfiguration description.
CommandRequestSet	Set of command requests, each as defined in command request element	A set of command requests, each containing a command type and a command request

When generated:
This primitive is generated by the CE when it needs to request the reconfiguration of the corresponding TVBD network/device.

Effect on receipt:
When TVBD network/device receives this primitive from CE, it shall perform the reconfiguration based on the parameter information in this primitive.

5.2.2.3.1.2 COEX_ResourceConfigure. response

Function:
This primitive used by TVBD network/device to report the results of the requested reconfiguration
Semantics:
COEX_Reconfigure.response(
sourceID
destiantionID
DialogToken
ReconfigurationParameters
reconfigurationstatus
CommandResponseSet
)

Parameters:

Name	Data Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
DialogToken	Interger	The Dialog Token to identify the command transaction.
ReconfiguraitonParameters	COEX_RC_PARAMETERS	The status information of reconfiguration parameters is provided with • accepted values of parameters when reconfiguration is succeed • recommended values of parameters when reconfiguration is failed
reconfigurationstatus	Boolen	This parameter shows the status of reconfiguration.

CommandResponseSet	Set of command responses, each as defined in command response element	A set of command responses, each containing a command type and a command response

When generated:
This primitive is generated by TVBD network/device in response to a COEX_Reconfigure.request primitive.

Effect on receipt:
When CE receives this primitive from TVBD network/device, the CE shall examine the status of the reconfiguration.

5.2.2.4 Measurement service

5.2.2.4.1 COEX_Measurement

5.2.2.4.1.1 COEX_Measurement.request

Function:

This primitive is used by CE to request TVBD network/device to perform the measurement required for coexistence.

Semantics:

```
COEX_Measurement.request(
        sourceID
        destinationID
        DialogToken          MeasurementID,
        ChannelNumberList,
        MeasurementOptions
        measurementDescription
        MeasurementRequestSet
)
```

Parameters:

Name	Data Type	Description
sourceID	COEX_ID	This identifies a CE that is source of this request
destinationID	COEX_ID	This identifies a TVBD that is destination of this request
DialogToken	Interger	The Dialog Token to identify the command transaction.
MeasurementID	COEX_MES_ID	Measurement list such as • TVBD QoS • TVBD spectrum sensing
ChannelNumberList	SEQUENCE OF INTEGER	Measuring channel number list
MeasurementOptions	COEX_MES_OPTIONS	Measurement options such as • Measurement duration • Measurement frequency range
measurementDescription	MeasurementDescription	Measurement Description
MeasurementRequestSet	Set of measurement requests,	A set of measurement requests, each

	each as defined in measurement request element	containing a measurement type and a measurement request

When generated:
This primitive is generated by the CE to request TVBD network/device to perform measurement required for coexistence.

Effect on receipt:
When TVBD network/device receives this primitive from CE, it shall perform the measurements based on the measurement options/Description in this primitive..

5.2.2.4.1.2 COEX_Measurement.response

Function:
This primitive used by TVBD network/device to provide the results of the measurement to CE.

Semantics:
COEX_TVBD_MES.response(
sourceID
destinationID
DialogToken
MeasurementID,
ChannelNumberList,
MeasurementResults,
MeasurementParameters
measurementResult
MeasurementReportSet
)

Parameters:

Name	Data Type	Description
sourceID	COEX_ID	This identifies a TVBD that is source of this request
destinationID	COEX_ID	This identifies a CE that is destination of this request
DialogToken	Interger	The Dialog Token to identify the command transaction.
MeasurementID	COEX_MES_ID	Measurement ID
ChannelNumberList	SEQUENCE OF INTEGER	Measured channel number list
MeasurementResults	COEX_MES_RESULTS	Measurement results
MeasurementParameters	COEX_MES_OPTIONS	Actual measurement parameters such as • Actual measurement duration • Actual measurement frequency range
measurementResult	MeasurementResult	Measurement Result
MeasurementReportSet	Set of measurement reports, each as defined in measurement report element	A set of measurement reports, each containing a measurement type and a measurement report

When generated:
This primitive is generated by TVBD network/device in response to a COEX_Measurement.request primitive.

Effect on receipt:

When CE receives this primitive from TVBD network/device, the CE shall examine the measurement results required for coexistence.

5.2.2.4.1.3 COEX_Measurement.indication

Function
Used by TVBD network/device to provide measurement results to CE.

Semantics
GetAvailableChannelList.indication (
measurementResult
)

Name	Type	Description
MeasurementResult	MeasurementResult	Measurement Result

When generated
Generated by TVBD network/device in response to GetMeasurement.request from CE.

Effect on receipt
When CE receives this primitive, it examines the received measurement results required for coexistence.

5.2.2.5 Event service

5.2.2.5.1 COEX_TVBD_EV

5.2.2.5.1.1 COEX_Evet.request

Function:
This primitive, which is periodically generated, is used by CE is transmitted to TVBD to request the event detection of the corresponding TVBD.

Semantics:
COEX_TVBD_EV.request(
EventIDS
)

Parameters:

Name	Data Type	Description
EventIDs	COEX_EV_IDS	Event list such as • TVBD QoS event, which is detected when QoS of TVBD is degraded under the required reliability. • TVBD geolocation change • TVBD coverage change

When generated:
This primitive is generated by the CE when it needs to request the event detection of the corresponding TVBD.

Effect on receipt:
When receiving this primitive from CE, the TVBD shall notify whether the event of the corresponding TVBD is occurred or not.

5.2.2.5.1.2 COEX_Event.response

Function:
This primitive used by TVBD is transmitted to CE to notify whether the event of the corresponding TVBD is occurred or not.

Semantics:
COEX_TVBD_EV.response(
EventStatus
)

Parameters:

Name	Data Type	Description
EventStatus	COEX_EV_STATUS	Detected event such as • TVBD QoS change • TVBD geolocation change • TVBD coverage change

When generated:
This primitive is generated in response to a COEX_TVBD_EV.request primitive.

Effect on receipt:
When receiving this primitive from TVBD, the CE shall send the response of the detected event of the corresponding TVBD to CM only if the event is occured.

5.2.2.5.2 COEX_Event

5.2.2.5.2.1 COEX_Event.indication

Function
Used by TVBD network/device to inform CE about events related to coexistence observed or predicted by TVBD network/device. Also, used by CE to inform TVBD network/device about events related to coexistence observed or predicted by IEEE 802.19.1 system
.

Semantics
EVENT.indication(
eventParams
)

Name	Type	Description
eventParams	EventParams	This parameter contains list of event parameters.

When generated
Generated by TVBD network/device to inform CE about events related to coexistence observed or predicted by TVBD network/device.
Generated by CE to inform TVBD network/device about events related to coexistence observed or predicted by IEEE 802.19.1 system.

Effect on receipt

When CE receives this primitive, it examines the received information about events realted to coexistence observed or predicted by TVBD network/device.
When TVBD network/device receives this primitive, it examines the received information about events realted to coexistence observed or predicted by IEEE 802.19.1 system.

5.3 Data type definition

5.3.1 Coexistence Network SAP data types /Coexistence Transport SAP data types

5.3.1.1 Transport service

The following data types are defined for Coexistence Transport SAP.

```
TRANSPORT_PREF: : = ENUMERATED{
    TCP,
    UDP,
    HTTP,
    SNMP,
    …
}

TRAMSPORT_ADDR : : = OCTET_STRING
```

5.3.2 Coexistence Media/Link/DME SAP

5.3.2.1 Registration service

```
COEX_ID::=CHOICE{
        CE_ID INTEGER,
        TVBD_ID INTEGER
        }

Status::= ENUMERATED {
    Success,
    Failure
}

NetworkID ::= ENUMERATED {
            BSSID,
            …
}

ServiceType::= ENUMERATED {
            Discovery,
            Management
}
```

5.3.2.2 Information service

```
NetworkType ::= ENUMERATED {
```

```
    IEEE802.11af,
        IEEE802.22,
        ECMA392,
        …
}

OperatingTVChannelList ::= SEQUENCE OF INTEGER

NeighbourList ::= SEQUENCE OF SEQUENCE {
    networkID           NetworkID,
        networkType         NetworkType,
        operatingTVChannelList          OperatingTVChannelList
}

RegulatoryDomain ::= ENUMERATED {
    USA,
        UK,
        Singapore,
        …
}

AvailableChannelList ::= SEQUENCE OF SEQUENCE {
    TVChannelNumber    INTEGER,
    txPowerLimit       REAL
}

ServiceArea ::= TBD

InterferenceArea ::= TBD

RequriedServiceCoverage ::= TBD


SeparateDistance ::= TBD

Coverage ::= TBD


TVBD_ GEOLOCATION : : = SEQUENCE {
    LatitudeResolution REAL,
    Latitude            REAL,
    LongitudeResolution REAL,
    Longitude       REAL,
    AltitudeResolution REAL
    Altitude            REAL
}

ANT_POLAR : : = ENUMERATED{
HorizontalPolarization,
VerticalPolarization,
LeftHandCircularPolarization,
RightHandCircularPolarization,
…
}

TVBD_RC_OPTION_ID : : = ENUMERATED {
```

```
    TransmitPowerControlResolution,
    TransmitPowerRange,
    ReconfigurableAntenna PolarizationList,
    AntennaHPBWControlResolution,
    AntennaHPBWControlRange,
    …
}

TVBD_RC_OPTION _VALUE : : = CHOICE {
    TransmitPowerControlResolution          REAL,
    TransmitPowerRange              REAL,
    ReconfigurableAntenna PolarizationList      SEQUENCE OF ANT_POLAR,
    AntennaHPBWControlResolution            REAL,
    AntennaHPBWControlRange             REAL,
    …
}

TVBD_RC_OPTION : : = SEQUENCE {
    RCOptionsID                 TVBD_RC_OPTION_ID,
    RCOptionsValue                  TVBD_RC_OPTION_VALUE
}

COEX_TVBD_RC_OPTIONS : : = SEQUENCE OF TVBD_RC_OPTION



CoexInfoID CHOICE {
    serviceType,
    networkID,
    networkType,
    operatingTVChannelList,
    serviceArea,
    interferenceArea,

    requiredBandwidth,
    requriedServiceDuration,
    requriedServiceCoverage,
    antennaGain,
    antennaHeight,
    geolocation,
    reconfigurationOptions,

    geolocation,
    separateDistance,
    coverage
}

CoexInfoIDs ::= SEQUENCE OF CoexInfoID

CoexInfoValue CHOICE {
    serviceType         ServiceType,
    networkID       NetworkID,
    networkType         NetworkType,
    operatingTVChannelList      OperatingTVChannelList,
    serviceArea         ServiceArea,
    interferenceArea            InterferenceArea,
```

```
    requiredBandwidth          REAL,
    requriedServiceDuration    GeneralizedTime,
    requriedServiceCoverage    RequriedServiceCoverage,
    antennaGain                REAL,
    antennaHeight              REAL,
    geolocation                TVBD_ GEOLOCATION,
    reconfigurationOptions     COEX_TVBD_RC_OPTIONS,

    geolocation                Geolocation,
    separateDistance           SeparateDistance,
    coverage                   Coverage
}

CoexInfoValues ::= SEQUENCE OF CoexInfoValue
```

5.3.2.3 Reconfiguration service

```
COEX_MODE : : = ENUMERATED{
    IndividualChannelAssignmentMode,
    CoChannelSaringMode,
    …
}

COEX_CH_CLASSIFICATION : : = SEQUENCE {
    AllowedChannelList              SEQUENCE OF INTEGER,
    AvailableChannelList            SEQUENCE OF INTEGER,
    RestrictedChannelList           SEQUENCE OF INTEGER
}

COEX_SER_TIME : : = SEQUENCE {
    StartTime          INTEGER,
    EndTime            INTEGER
}

ANT_POLAR : : = ENUMERATED{
    HorizontalPolarization,
    VerticalPolarization,
    LeftHandCircularPolarization,
    RightHandCircularPolarization,
    …
}

COEX_RC_OPTIONS : : = SEQUENCE {
    TransmitPower              REAL,
    AntennaPolarization        ANT_POLAR,
    AntennaHPBW                REAL
}

RC_PARAMETER_ID : : = ENUMERATED{
    CoexistenceMode,
    OperatingChannelList,
    ServiceStartEndTime,
    ServiceCoverage,
    ReconfigurationOptions,
```

```
    …
}

RC_PARAMETER_VALUE : : = CHOICE{
    CoexistenceMode                 COEX_MODE,
    OperatingChannelList            SEQUENCE OF INTEGER,
    ServiceStartEndTime             COEX_SER_TIME,
    ServiceCoverage                 REAL,
    ReconfigurationOptions          COEX_RC_OPTIONS,
    …
}

RC_PARAMETER : : = SEQEUNCE{
    RCParametersID                  RC_PARAMETER_ID,
    RCParameterStatus               BOOLEAN,
    RCParameterValue                RC_PARAMETER_VALUE
}

COEX_RC_PARAMETERS : : = SEQUENCE OF RC_PARAMETER


ReconfigurationRequest ::= SEQUENCE OF SEQUENCE {
    operationChannel  OperationChannel,
    txPowerLimit  REAL,
    channelIsShared    BOOLEAN,
    txScheduleSEQUENCE OF TxSchedule
}

TxSchedule ::= SEQUENCE {
    scheduleStartTimeREAL,
    scheduleDuration  REAL,
    numberOfScheduleRepetitions    INTEGER,
    transmissionStartTimeREAL,
    transmissionDuration  REAL
}
```

5.3.2.4 Measurement service

```
COEX_MES_ID : : = ENUMERATED{
    TVBDQoS,
    TVBDSpectrumSensing,
    …
}

COEX_MES_OPTIONS : : = ENUMERATED{
    MeasureDuration                 INTEGER,
    MeasureFrequencyRange           REAL,
            …
}

COEX_MES_RESULTS : : = ENUMERATED{
    TVBDQoSResult                       REAL,
    TVBDSpecrumSensingResults           REAL,
    …
}
```

MeasurementDescription ::= TBD

MeasurementResult ::= TBD

5.3.2.5 Event service

```
EV_ID : : = ENUMERATED {
    TVBDQoSChange,
    TVBDGeolocationChange,
    TVBDCoverageChange,
    …
}

COEX_EV_IDS : : = SEQUENCE OF EV_ID

COEX_EV_STATUS : : = SEQUENCE{
EventID             EV_ID,
EventStatus         BOOLEAN
}


EventParams:: = TBD
```