IEEE P802.19
Wireless Coexistence Working Group

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Contents

5. IEEE 802.19.1 reference model

5.1 General description

Figure 1 illustrates reference model of a Coexistence Enabler.

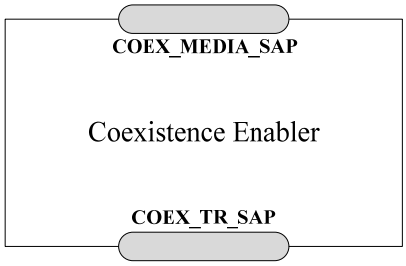

Figure 1—Reference model of a Coexistence Enabler

The Coexistence Enabler has two service access points:

— Coexistence Media SAP (COEX_MEDIA_SAP)
— Coexistence Transport SAP (COEX_TR_SAP).

Figure 2 illustrates reference model of a Coexistence Manager and a Coexistence Discovery and Information Server.

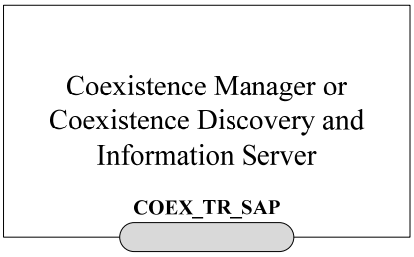

Figure 2— Reference model of a Coexistence Manager and a Coexistence Discovery and Information Server

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

— Coexistence Transport SAP (COEX_TR_SAP).

COEX_MEDIA_SAP defines the interface A between the CE and a TVBD network/device. Example reference model of a CE describing an example implementation of the interface A inside a base station is shown in Figure 3.

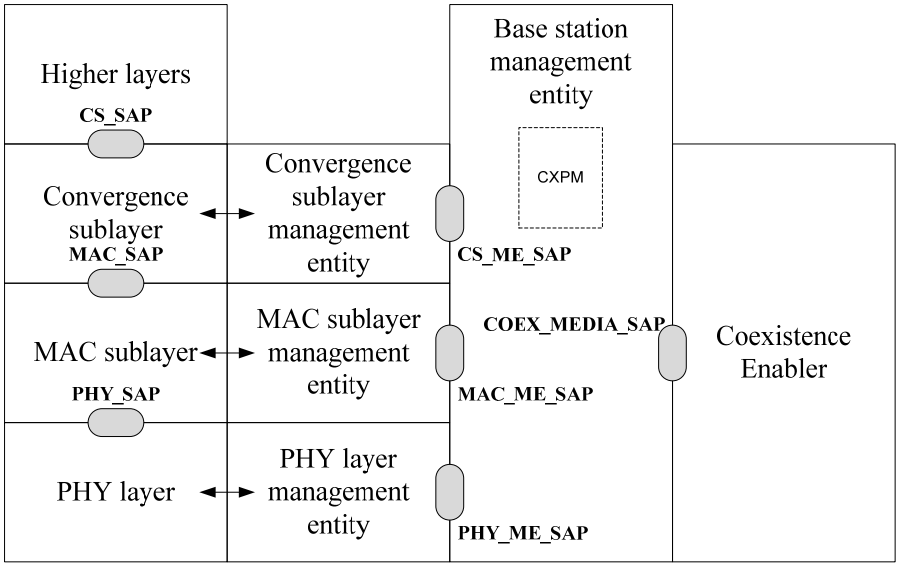

Figure 3— Example reference model for the interface A

The left side of Figure 3 shows a typical reference model of a radio interface including data, control and management planes for physical layer, MAC sublayer, and convergence sublayer. The middle part of the Figure 3 shows the base station management entity. The right part of Figure 3 shows the CE.

Typically, the radio interface is implemented in such a way that it provides a management interface for the base station management entity. In Figure 3, such interface is represented by three service access points PHY_ME_SAP, MAC_ME_SAP, and CS_ME_SAP, corresponding to the physical layer, the MAC sublayer, and the convergence sublayer. These service access points can be used to obtain information from the radio interface and to request reconfiguration of the radio interface. Correspondingly, the CE can use these service access points to implement the interface A. The interface A is defined by the service access point COEX_MEDIA_SAP. Communication between the radio interface management service access points PHY_ME_SAP, MAC_ME_SAP, and CS_ME_SAP and the CE service access point COEX_MEDIA_SAP is done via the base station management entity. Base station management entity (i.e., TVBD network or device management entity) provides CXPM (coexistence primitive mapping) service. CXPM converts CX_MEDIA_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.

The COEX_TR_SAP provides means for a Coexistence Enabler, a Coexistence Manager, and a 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 a CE and a CM describing example of using COEX_TR_SAP for interface B1 is shown in Figure 4.

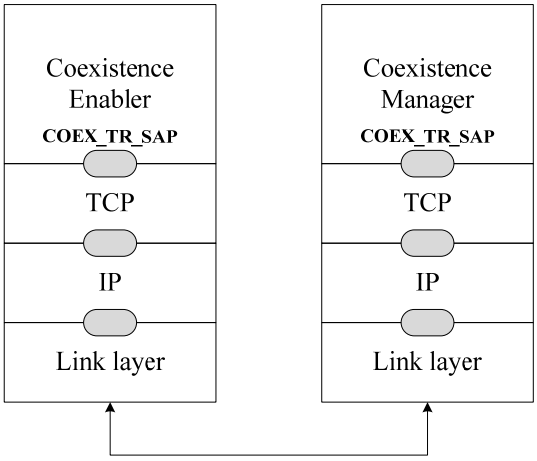

Figure 4— Example of using COEX_TR_SAP for interface B1

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

5.2 Service access points

5.2.1 COEX_TR_SAP

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

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

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

Table 1—Coexistence Transport SAP primitives

Primitive	Service	Description
CP_PACKET_SEND	Transport	Used by a CE, CM, CDIS or external entity to send a coexistence protocol data unit using a transport service provider.
CP_PACKET_RECEIVE	Transport	Used by a transport service provider to deliver a coexistence protocol data unit to a CE, CM, CDIS or external entity.

Transport service

5.2.1.1.1 CP_PACKET_SEND.request

Function:
Used by a CE, a CM, a CDIS or an external entity to request the transport service provider to transport a coexistence protocol data unit.
Semantics:
CP_PACKET_SEND.request (

    transportPref,

    sourceID,

    destinationID,

    coexProtocolPDU

)

Name	Data Type	Description
transportPref	TransportPref	Transport protocol preference.
sourceID	OCTET_STRING	Address of the entity sending a coexistence protocol data unit.
destinationID	OCTET_STRING	Address of the entity to receive a coexistence protocol data unit.
coexProtocolPDU	OCTET_STRING	Coexistence protocol data unit to be transported.

When generated:
Generated by a CE, a CM, a CDIS or an external entity to request the transport service provider to transport a coexistence protocol data unit.
Effect on receipt:
The specific transport service provider receiving this primitive attempts to transport the coexistence protocol data unit.

5.2.1.1.2 CP_PACKET_SEND.confirm

Function:
Used by a transport service provider to acknowledge transportation of the coexistence protocol data unit if such acknowledgment is supported by the transport service provider.
Semantics:
CP_PACKET_SEND.confirm (

    transportPref,

    sourceID,

    destinationID,

    transportStatus

)

Name	Data Type	Description

transportPref	TransportPref	Transport protocol used.
sourceID	OCTET_STRING	Address of the entity sending a coexistence protocol data unit.
destinationID	OCTET_STRING	Address of the entity to receive a coexistence protocol data unit.
transportStatus	BOOLEAN	Indicates whether the transfer of a coexistence protocol data unit was successful or not.

When generated:
Generated by the transport service provider to indicate whether the transfer of a coexistence protocol data unit is successful or not if such acknowledgement is supported by the transport service provider.
Effect on receipt:
When a CE, a CM, a CDIS or external entity receives this primitive, it learns about the status of the requested delivery of coexistence protocol data unit.

5.2.1.1.3 CP_PACKET_RECEIVE

Function:
Used by a transport service provider to deliver a coexistence protocol data unit to a CE, a CM, a CDIS or an external entity.
Semantics:
CP_PACKET_RECEIVE (

    transportPref,

    sourceID,

    coexProtocolPDU

)

Name	Data Type	Description
transportPref	TransportPref	Transport protocol used.
sourceID	OCTET_STRING	Address of the entity from which a coexistence protocol data unit was received.
coexProtocolPDU	OCTET_STRING	The received coexistence protocol data unit.

When generated:
Generated by the transport service provider when it has coexistence protocol data unit for CE, CM, CDIS or external entity
Effect on receipt:
The CE, CM, CDIS or external entity receiving this primitive gets a coexistence protocol data unit.

5.2.2 COEX_MEDIA_SAP

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

— Authentication service
  — Used by the TVBD network or device to provide its authentication information to the coexistence system
— Subscription service
  — Used by the TVBD network or device to provide its subscription information to the coexistence system and to update this subscription information

- Used by the coexistence system to ask TVBD network or device to change its subscribed coexistence service.

- Registration service
  - Used by the TVBD network or device to provide its registration information to the coexistence system and to update this registration information
- Information service
  - Used by the CE to send a neighbor report to the TVBD network or device subscribed to the coexistence information service
  - Used by the CE to obtain an available channel list from the TVBD network or device subscribed to the coexistence management service
  - Used by the CE to obtain information required for coexistence from the TVBD network or device subscribed to the coexistence management service
  - Used by the TVBD network or device to obtain channel classification information from the coexistence system
- Measurement service
  - Used by the CE to obtain measurement results required for coexistence from the TVBD network or device subscribed to the coexistence management service
- Reconfiguration service
  - Used by the CE to request the TVBD network or device subscribed to the coexistence management service to perform reconfiguration required for coexistence
  - Used by TVBD network or device to request for resource
- Event service
  - Used by the CE and TVBD network or device to exchange indications of events related to coexistence.

Primitives described in Table 2 are used to define the Coexistence Media SAP.

Table 2—Coexistence Media SAP primitives

Primitive	Service	Description
GetAuthInfo	Authentication	Used by the TVBD network or device for authentication with the coexistence system
GetServiceSubscription	Subscription	Used by the TVBD network or device to provide its subscription information to the coexistence system
NewServiceSubscription		Used by the TVBD network or device to update its subscription information in the coexistence system
ChangeSubscription		Used by CE to ask TVBD network or device to change its subscription to the coexistence service
GetRegInfo	Registration	Used by the TVBD network or device to provide its registration information to the coexistence system
NewRegInfo		Used by the TVBD network or device to update its registration information in the coexistence system
NeighborReport	Information	Used by the CE to send neighbor report to the TVBD network or device subscribed to the coexistence information service

AvailableChannelList		Used by the CE to obtain available channel list from the TVBD network or device subscribed to the coexistence management service
ChannelClassification		Used by the TVBD network or device to obtain channel classification information from the coexistence system
GetInfo		Used by the CE to obtain information required for coexistence from the TVBD network or device subscribed to the coexistence management service
GetMeasurement	Measurement	Used by the CE to obtain measurement results required for coexistence from the TVBD network or device subscribed to the coexistence management service
PerformReconfiguration	Reconfiguration	Used by the CE to request the TVBD network or device subscribed to the coexistence management service to perform reconfiguration required for coexistence
ResourceReconfiguration		Used by TVBD network or device to request for resource
Event	Event	Used by the CE and TVBD network or device to exchange indications of events related to coexistence

Authentication service

5.2.2.1.1 GetAuthInfo

5.2.2.1.1.1 GetAuthInfo.request

Function

Used by a CE to request authentication information from the TVBD network or device.

Semantics

GetAuthInfo.request()

When generated

Generated by the CE to obtain authentication information from the TVBD network or device.

Effect on receipt

When the TVBD network or device receives this primitive, it sends a GetAuthInfo.response back to the CE.

5.2.2.1.1.2 GetAuthInfo.response

Function

Used by the TVBD network or device to provide the authentication information to the CE.

Semantics

GetAuthInfo.response (

UserID

UserPassword

)

Name	Type	Description
UserID	IA5String (ITU-T X.208)	This parameter contains User ID to be used by a CE to authenticate with the coexistence system.
UserPassword	IA5String	This parameter contains User Password to be used by a CE to authenticate with the coexistence system.

When generated

Generated by the TVBD network or device in response to a GetAuthInfo.request from the CE.

Effect on receipt

When the CE receives this primitive, it starts authentication of the TVBD network or device with the coexistence system.

5.2.2.1.1.3 GetAuthInfo.confirm

Function

Used by a CE to inform the TVBD network or device about the results of the authentication.

Semantics

GetAuthInfo.confirm(

status

)

Name	Type	Description
status	BOOLEAN	This parameter shows whether the authentication was successful or not.

When generated

Generated by the CE after an attempt to authenticate the TVBD network or device in the coexistence system.

Effect on receipt

If the authentication was not successful, the TVBD network or device re-examines its authentication information provided.

Subscription service

5.2.2.1.2 GetServiceSubscription

5.2.2.1.2.1 GetServiceSubscription.request

Function

Used by a CE to obtain subscription information from the TVBD network or device.

Semantics

GetServiceSubscription.request()

When generated

Generated by the CE to request the TVBD network or device to indicate the coexistence service which it wants to receive from the coexistence system.

Effect on receipt

When the TVBD network or device receives this primitive, it sends a GetServiceSubscription.response back to the CE.

5.2.2.1.2.2 GetServiceSubscription.response

Function

Used by the TVBD network or device to inform the CE about the coexistence service which it wants to receive from the coexistence system.

Semantics

GetServiceSubscription.response (

subscribedService

)

Name	Type	Description
subscribedService	SubscribedService	This parameter describes coexistence service that the TVBD network or device wishes to receive from the coexistence system.

When generated

Generated by the TVBD network or device in response to a GetServiceSubscription.request from the CE.

Effect on receipt

When CE receives this primitive, it requests a service subscription from a CM.

5.2.2.1.2.3 GetServiceSubscription.confirm

Function

Used by the CE to inform the TVBD network or device about the result of the subscription to the coexistence system.

Semantics

GetServiceSubscription.confirm(

status

)

Name	Type	Description
status	BOOLEAN	This parameter shows whether the subscription is successful or not.

When generated

Generated by the CE when response from the CM is received.

Effect on receipt

When the TVBD network or device receives this primitive, it acts depending on the result.

5.2.2.1.2.4 NewServiceSubscription.indication

Function

Used by the TVBD network or device to inform the CE that it wants to update its subscription to the coexistence services.

Semantics

NewServiceSubscription.indication (

subscribedService

)

Name	Type	Description
subscribedService	SubscribedService	This parameter describes the coexistence service that a TVBD network or device wishes to receive from the coexistence system.

When generated

Generated by the TVBD network or device when it wishes to change its subscription to the coexistence services.

Effect on receipt

When CE receives this primitive, it shall update the information of the subscribed coexistence service of its TVBD network or device in the coexistence system.

5.2.2.1.3 ChangeSubscription

5.2.2.1.3.1 ChangeSubscription.request

Function

Used by the CE to ask the TVBD network or device to change its subscription to the coexistence services.

Semantics

ChangeSubscription.request(

    newSubscribedService

)

Name	Type	Description
newSubscribedService	SubscribedService	Proposed new subscribed coexistence service

When generated

Generated by the CE when it needs to ask the TVBD network or device to change its subscription to the coexistence services.

Effect on receipt

When TVBD network or device receives this primitive, it shall send ChangeSubscription.response back to CE.

5.2.2.1.3.2 ChangeSubscription.response

Function

Used by the TVBD network or device accept/reject the request to change its subscription to the coexistence services.

Semantics

ChangeSubscription.request(

    status

)

Name	Type	Description
status	BOOLEAN	Status: accepted or not

When generated

Generated by the TVBD network or device in response to the ChangeSubscription.request from the CE.

Effect on receipt

When the CE receives this primitive it reports the status to the CM.

Registration service

5.2.2.1.4 GetRegInfo

5.2.2.1.4.1 GetRegInfo.request

Function

Used by a CE to request the TVBD network or device to provide registration information.

Semantics

GetRegInfo.request ( )

When generated

Generated by the CE to request the TVBD network or device to provide registration information.

Effect on receipt

When the TVBD network or device receives this primitive, it shall send a GetRegInfo.response back to the CE.

5.2.2.1.4.2 GetRegInfo.response

Function

Used by the TVBD network or device to provide requested registration information to CE.

Semantics

GetRegInfo.response (

networkID,

networkTechnology,

networkType,

discoveryInformation,

ACLR,

ACS,

guranteedQoSOfBackhaulConnection,

listOfSupportedFrequencies,

listOfSupportedChNumber

minTxPower,

txScheduleSupported,

networkTechnologyReconfigurationSupported,

addNetworkTechnology,

listOfOperatingFrequencies,

listOfOperatingChNumber,

radioEnvironmentInformation OPTIONAL,

requiredResource

)

Name	Type	Description
networkID	NetworkID	E.g., BSS ID
networkTechnology	NetworkTechnology	E.g., 802.11af, 802.22
networkType	NetworkType	E.g., fixed, mode 2
discoveryInformation	DiscoveryInformation	Information for neighbor discovery, e.g., location information, maximum transmission power, receiver sensitivity, antenna gain, minimum SINR required for system operation, other information needed to calculate coverage and interference areas
ACLR	REAL	Adjacent Channel Leakage Ratio of the TVBD device
ACS	REAL	Adjacent Channel Selection of the receiver
guranteedQoSOf BackhaulConnection	GuranteedQoSOf BackhaulConnection	Guaranteed QoS of backhaul connection in the TVBD device
listOfSupportedFrequencies	ListOfSupportedFrequencies OPTIONAL	List of supported operating frequencies
listOfSupportedChNumber	SEQUENCE OF INTEGER OPTIONAL	List of supported channel numbers
minTxPower	REAL	Minimum transmission power
txScheduleSupported	BOOLEAN	Indicates whether scheduled transmission is supported or not
networkTechnology	BOOLEAN	Indicates whether network technology reconfiguration can be

ReconfigurationSupported		requested by CM
addNetworkTechnology	SEQUENCE OF NetworkTechnology	Additional supported network technologies
listOfOperatingFrequencies	ListOfOperatingFrequencies OPTIONAL	List of operating frequencies including occupancy of each operating frequency
listOfOperatingChNumber	SEQUENCE OF INTEGER OPTIONAL	List of operating channel numbers
radioEnvironmentInformation	RadioEnvironmentInformation OPTIONAL	Information on radio environment as observed by this TVBD network or device
requiredResource	RequiredResource	Information on resource required for operation of this TVBD network or device

When generated

Generated by the TVBD network or device in response to the GetRegInfo.request from the CE.

Effect on receipt

When the CE receives this primitive it registers the TVBD network or device in the coexistence system.

5.2.2.1.5 NewRegInfo

5.2.2.1.5.1 NewRegInfo.indication

Function

Used by a TVBD network or device to update its registration information in the coexistence system.

Semantics

NewRegInfo.indication (

networkID,

networkTechnology,

networkType,

discoveryInformation,

ACLR,

ACS,

guranteedQoSOfBackhaulConnection,

listOfSupportedFrequencies,

listOfSupportedChNumber,

minTxPower,

txScheduleSupported,

networkTechnologyReconfigurationSupported,

addNetworkTechnology,

listOfOperatingFrequencies,

listOfOperatingChNumber,

radioEnvironmentInformation OPTIONAL,

requiredResource

)

Name	Type	Description
networkID	NetworkID	E.g., BSS ID
networkTechnology	NetworkTechnology	E.g., 802.11af, 802.22
networkType	NetworkType	E.g., fixed, mode 2
discoveryInformation	DiscoveryInformation	Information for neighbor discovery, e.g., location information, maximum transmission power, receiver sensitivity, antenna gain, minimum SINR required for system operation, other information needed to calculate coverage and interference areas
ACLR	REAL	Adjacent Channel Leakage Ratio of the TVBD device
ACS	REAL	Adjacent Channel Selection of the receiver
guranteedQoSOf BackhaulConnection	GuranteedQoSOf BackhaulConnection	Guaranteed QoS of backhaul connection in the TVBD device
listOfSupportedFrequencies	ListOfSupportedFrequencies OPTIONAL	List of supported operating frequencies
listOfSupportedChNumber	SEQUENCE OF INTEGER OPTIONAL	List of supported channel numbers

minTxPower	REAL	Minimum transmission power
txScheduleSupported	BOOLEAN	Indicates whether scheduled transmission is supported or not
networkTechnology ReconfigurationSupported	BOOLEAN	Indicates whether network technology reconfiguration can be requested by CM
addNetworkTechnology	SEQUENCE OF NetworkTechnology	Additional supported network technologies
listOfOperatingFrequencies	ListOfOperatingFrequencies OPTIONAL	List of operating frequencies including occupancy of each operating frequency
listOfOperatingChNumber	SEQUENCE OF INTEGER OPTIONAL	List of operating channel numbers
radioEnvironmentInformation	RadioEnvironmentInformation OPTIONAL	Information on radio environment as observed by this TVBD network or device
requiredResource	RequiredResource	Information on resource required for operation of this TVBD network or device

When generated

Generated by the TVBD network or device when its registration information is changed.

Effect on receipt

When the CE receives this primitive, it updates the registration information with the most newly received values.

Information service

5.2.2.1.6 NeighborReport

5.2.2.1.6.1 NeighborReport.request

Function

Used by a TVBD network or device subscribed to the coexistence information service to request a neighbor report.

Semantics

NeighborReport.indication()

When generated

Generated by the TVBD network or device to request a neighbor report.

Effect on receipt

When the CE receives this primitive, it sends NeighborReport.response back to TVBD network or device.

5.2.2.1.6.2 NeighborReport.response

Function

Used by a CE to provide a neighbor report to the TVBD network or device subscribed to the coexistence information service.

Semantics

NeighborReport.response(

neighborReport

)

Name	Type	Description
neighborReport	NeighborReport	Information about neighbors of the TVBD network or device in form of a neighbor report

When generated

Generated by the CE in response to NeighborReport.request from the TVBD network or device.

Effect on receipt

When the TVBD network or device receives this primitive, it updates the neighbor information with the new information provided in this primitive.

5.2.2.1.6.3 NeighborReport.indication

Function

Used by a CE to provide a neighbor report to the TVBD network or device subscribed to the coexistence information service.

Semantics

NeighborReport.indication (

neighborReport

)

Name	Type	Description
neighborReport	NeighborReport	The list of neighbors of the TVBD network or device

When generated

Generated by the CE to provide a neighbor report to the TVBD network or device.

Effect on receipt

When the TVBD network or device receives this primitive, it updates the neighbor information with the new information provided in this primitive.

5.2.2.1.7 AvailableChannelList

5.2.2.1.7.1 AvailableChannelList.request

Function

Used by a CE to obtain an available channel list from the TVBD network or device

Semantics

AvailableChannelList.request()

When generated

Generated by the CE to obtain an available channel list from the TVBD network or device.

Effect on receipt

When the TVBD network or device receives this primitive, it sends an AvailableChannelList.response back to the CE.

5.2.2.1.7.2 AvailableChannelList.response

Function

Used by a TVBD network or device to provide its list of available channels to the CE.

Semantics

AvailableChannelList.response (

availableChannelList,

listOfAllowedTVWSChNumber,

constOfChUses

)

Name	Type	Description
availableChannelList	AvailableChannelList	Available channel list to operate in TVWS
listOfAllowedTVWSChNumber	ListOfAllowedTVWSChNumber OPTIONAL	Allowed TVWS channel number list
constOfChUses	ConstOfChUses OPTIONAL	Channel user constraint

When generated

Generated by the TVBD network or device in response to an AvailableChannelList.request from the CE.

Effect on receipt

When the CE receives this primitive, it provides the available channel list to the CM.

5.2.2.1.7.3 AvailableChannelList.indication

Function

Used by the TVBD network or device to update the list of its available channels to the CE.

Semantics

AvailableChannelList.indication (

availableChannelList,

listOfAllowedTVWSChNumber,

constOfChUses

)

Name	Type	Description
availableChannelList	AvailableChannelList	Available channel list to operate in TVWS
listOfAllowedTVWSChNumber	ListOfAllowedTVWSChNumber OPTIONAL	Allowed TVWS channel number list
constOfChUses	ConstOfChUses OPTIONAL	Channel user constraint

When generated

Generated by the TVBD network or device if information in the list of available channels has changed.

Effect on receipt

When the CE receives this primitive, it provides the list of available channels to the CM.

5.2.2.1.8 ChannelClassification

5.2.2.1.8.1 ChannelClassification.request

Function

Used by a TVBD network or device subscribed to coexistence information service to obtain channel classification information.

Semantics

ChannelClassification.request(

listOfNetworkID

)

Name	Type	Description
listOfNetworkID	SEQUENCE OF NetworkID	Network ID list

When generated

Generated by the TVBD network or device to obtain channel classification information.

Effect on receipt

When the CE receives this primitive, it sends a ChannelClassification.response back to the TVBD network or device.

5.2.2.1.8.2 ChannelClassification.response

Function

Used by a CE to provide channel classification information to the TVBD network or device.

Semantics

CannelClassification.response(

chClassInfoList

)

Name	Type	Description
chClassInfoList	ChClassInfoList	Channel classification information list

When generated

Generated by the CE in response to a ChannelClassification.request from the TVBD network or device.

Effect on receipt

When the TVBD network or device receives this primitive, it gets requested channel classification information.

5.2.2.1.8.3 ChannelClassification.announcement

Function

Used by a CE to provide updated channel classification information to the TVBD network or device.

Semantics

ChannelClassification.announcement(

chClassInfoList

)

Name	Type	Description
chClassInfoList	ChClassInfoList	Channel classification information list

When generated

Generated by the CE if channel classification information has changed.

Effect on receipt

When the TVBD network or device receives this primitive, it gets requested channel classification information.

5.2.2.1.9 GetInfo

5.2.2.1.9.1 GetInfo.request

Function

Used by a CE to obtain information from the TVBD network or device.

Semantics

GetInfo.request(

    reqInfoDescr

)

Name	Type	Description
reqInfoDescr	ReqInfoDescr	Requested information ID.

When generated

Generated by the CE to request the TVBD network or device to provide coexistence information.

Effect on receipt

When the TVBD network or device receives this primitive, it sends a GetInfo.response back to the CE.

5.2.2.1.9.2 GetInfo.response

Function

Used by a TVBD network or device to provide requested information to the CE.

Semantics

GetRegInfo.response (

    reqInfoValue

)

Name	Type	Description
reqInfoValue	ReqInfoValue	Requested information

When generated

Generated by the TVBD network or device in response to a GetInfo.request from the CE.

Effect on receipt

When the CE receives this primitive, it examines the received information.

Measurement service

5.2.2.1.10 GetMeasurement

5.2.2.1.10.1 GetMeasurement.request

Function

Used by a CE to request the TVBD network or device to perform measurements.

Semantics

GetMeasurement.request(

measurementDescription

)

Name	*Type*	*Description*
measurementDescription	MeasurementDescription	Measurement Description

When generated

Generated by the CE to request the TVBD network or device to perform measurements.

Effect on receipt

When the TVBD network or device receives this primitive, it performs measurements required by the CE and responds back either with a GetMeasurement.response or a GetMeasurement.indication.

5.2.2.1.10.2 GetMeasurement.response

Function

Used by a TVBD network or device to provide one time measurement results to the CE.

Semantics

GetAvailableChannelList.response (

measurementResult

)

Name	Type	Description
measurementResult	MeasurementResult	Measurement Result

When generated

Generated by the TVBD network or device in response to a GetMeasurement.request from the CE to provide one time measurement results.

Effect on receipt

When the CE receives this primitive, it examines the received measurement results.

5.2.2.1.10.3 GetMeasurement.indication

Function

Used by a TVBD network or device to provide scheduled measurement results to the CE.

Semantics

GetMeasurement.indication (

measurementResult

)

Name	Type	Description
measurementResult	MeasurementResult	Measurement Result

When generated

Generated by the TVBD network or device in response to a GetMeasurement.request from the CE to provide scheduled measurement results.

Effect on receipt

When the CE receives this primitive, it examines the received measurement results.

Reconfiguration service

5.2.2.1.11 PerformReconfiguration

5.2.2.1.11.1 PerformReconfiguration.request

Function

Used by a CE to request reconfiguration of the TVBD network or device required for coexistence.

Semantics

PerformReconfiguration.request(

reconfigurationRequest,

chClassInfo

)

Name	Type	Description
reconfigurationRequest	ReconfigurationRequest	Reconfiguration description.
chClassInfo	ChClassInfo OPTIONAL	Channel classification info.

When generated

Generated by the CE to request the TVBD network or device to reconfigure.

Effect on receipt

When the TVBD network or device receives this primitive, it reconfigures according to reconfiguration description and sends a PerformReconfiguration.response to the CE.

5.2.2.1.11.2 PerformReconfiguration.response

Function

Used by a TVBD network or device to report the result of the requested reconfiguration to the CE.

Semantics

PerformReconfiguration.response (

reconfigurationStatus,

failedParameters

)

Name	Type	Description
reconfigurationStatus	BOOLEAN	This parameter shows the status of reconfiguration.
failedParameters	FailedParameters OPTIONAL	Failed reconfiguration parameters with recommended values of parameters id reconfiguration request is failed.

When generated

Generated by the TVBD network or device in response to a PerformReconfiguration.request from the CE.

Effect on receipt

When the CE receives this primitive, it examines the received information.

5.2.2.1.12 ResourceReconfiguration

5.2.2.1.12.1 ResourceReconfiguration.request

Function

Used by a TVBD network or device to request resource.

Semantics

ResourceReconfiguration.request(

networkType,

Geolocation,

ChannelNumber,

startFreq,

endFreq,

MaximumPowerLevel,

ChannelLoad

)

Name	Type	Description
networkType	NetworkType	TVBD device or network type
Geolocation	GEO_LOC	Registered geolocation
ChannelNumber	INTEGER OPTIONAL	Channel number
startFreq	REAL OPTIONAL	Start frequency
endFreq	REAL OPTIONAL	End frequency
MaximumPowerLevel	REAL	Power limit
ChannelLoad	REAL OPTIONAL	Expected throughput

When generated

Generated by the TVBD network or device to request new resource.

Effect on receipt

When the CE receives this primitive, it forwards this request to the CM.

5.2.2.1.12.2 ResourceReconfiguration.response

Function

Used by a CE to provide resource reconfiguration to the TVBD network or device.

Semantics

ResourceReconfiguration.response(

ChannelNumber,

startFreq,

endFreq,

MaximumPowerLevel

)

Name	Type	Description
ChannelNumber	INTEGER OPTIONAL	Channel number
startFreq	REAL OPTIONAL	Start frequency
endFreq	REAL OPTIONAL	End frequency
MaximumPowerLevel	REAL	Power limit

When generated

Generated by the CE to allocate resources to the TVBD network or device.

Effect on receipt

When the TVBD network or device receives this primitive, it follows the allocated resource.

Event service

5.2.2.1.13 Event

5.2.2.1.13.1 Event.indication

Function

Used by a TVBD network or device to inform the CE about events related to coexistence observed or predicted by the TVBD network or device.
Also, used by a CE to inform the TVBD network or device about events related to coexistence observed or predicted by the coexistence system.

Semantics

Event.indication(

eventParams

)

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

When generated

Generated by the TVBD network or device to inform the CE about events related to coexistence observed or predicted by the TVBD network or device.

Generated by the CE to inform the TVBD network or device about events related to coexistence observed or predicted by the coexistence system.

Effect on receipt

When the CE receives this primitive, it examines the received information about events related to coexistence observed or predicted by the TVBD network or device.

When the TVBD network or device receives this primitive, it examines the received information about events related to coexistence observed or predicted by the coexistence system.

5.3 Data type definition

5.3.1 COEX_TR_SAP

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

5.3.2 COEX_MEDIA_SAP

```
SubscribedService::= ENUMERATED{
    information,
    management

}
```

```
NetworkID::= ENUMERATED{
    BSSID,
    …
}

NetworkTechnology ::= ENUMERATED{
    IEEE802.11af,
    IEEE802.22,
    ECMA392,
    …
}

NetworkType ::= ENUMERATED{
    fixed,
    mode2,
    …
}

DiscoveryInformation ::= SEQUENCE{
    coordinateX      REAL,
    coordinateY      REAL,
    coordinateZ      REAL,
    maxTxPower    REAL,
    rxSensitivity     REAL,
    antennaGain     REAL,
    minReqSNR     REAL,
    TolerableInterferenceLevel    REAL,
```

```
    antennaHeight   REAL,
    …
}

ListOfSupportedFrequencies ::= SEQUENCE OF SEQUENCE{
    startFreq    REAL,
    stopFreq    REAL
}

ListOfOperatingFrequencies ::= SEQUENCE OF SEQUENCE{
    startFreq           REAL,
    stopFreq            REAL,
    occupancy           REAL,
    totalOccupancy    REAL OPTIONAL
}

FreqDescription ::= SEQUENCE{
    networkID               NetworkID    OPTIONAL,
    networkTechnology     NetworkTechnology    OPTIONAL,
    coexType                ENUMERATED{known, unknown},
    interferenceDirection    ENUMERATED{mutual, source, victim},
    occupancy               REAL OPTIONAL,
    totalOccupancy          REAL OPTIONAL
}

RadioEnvironmentInformation ::= SEQUENCE OF SEQUENCE{
    startFreq           REAL,
    stopFreq            REAL,
```

```
    state                ENUMERATED{free, occupiedKnown, occupiedUnknown, notMeasured},
    freqDescription    FreqDescription    OPTIONAL
}

NetworkGeometryClass ::= CHOICE{Class#1, Class#2, Class#3, Class#4}

NeighborReport ::= SEQUENCE OF SEQUENCE{
    networkID                        NetworkID,
    networkTechnology                NetworkTechnology,
    interferenceDirection            ENUMERATED{mutual, source, victim},
   interferenceLevelFromNeighbor  REAL,
    interferenceLevelToNeighbor     REAL,
    listOfOperatingChannelNumber    SEQUENCE OF INTEGER    OPTIONAL,
    listOfOperatingFrequencies       ListOfOperatingFrequencies    OPTIONAL,
    radioEnvironmentInformation    RadioEnvironmentInformation    OPTIONAL,
    networkGeometryClass    NetworkGeometryClass
}

AggregatedInterferferenceControlParameters :: =  SEQUENCE{
  ReferencePointID                  INTEGER,
  Geolocation                       ReferencePointGeolocation,
  ACS                               REAL,
  Antenna height                    REAL,
  Antenna gain                      REAL,
  Protection ratio                  REAL,
…
}

ReferencePointGeolocation :: = ENUMERATED {
  Latitude                          REAL,
  Longitude                         REAL,
  Altitude                          REAL,
…
}

AvailableChannelList::= SEQUENCE OF SEQUENCE{
```

```
    startFreq          REAL,
    stopFreq           REAL,
    txPowerLimit       REAL,
    aggregatedInterferferenceControlParameters    AggregatedInterferferenceControlParameters
}

RequiredResource ::= SEQUENCE OF SEQUENCE{
    requiredBandwidth    REAL,
    expectedLoad          REAL
}

ListOfAllowedTVWSChNumber ::= SEQUENCE OF INTEGER

ConstOfChUseID :: = ENUMERATED{
                    regulationMaxTxPower,
                    regulationMaxAntGain,
                    regulationMaxAntHeight,
                    regulationTVDBUpdateTime,
                    OutOfBandEmissionLimit,
                    …
}

ConstOfChUseValue :: = CHOICE{
                    regulationMaxTxPower                    REAL,
                    regulationMaxAntMaxGain                 REAL,
                    regulationAntMaxHeight                  REAL,
                    regulationTVDBUpdateTime                REAL,
                    OutOfBandEmissionLimit                  REAL,
                    …
}
ConstOfChUse : : = SEQUENCE{
                    constOfChUseID              ConstOfChUseID,
                    constOfChUseValue           ConstOfChUseValue
}
ConstOfChUses : : = SEQUENCE OF ConstOfChUse

OperatingChannelInfo :: =  SEQUENCE {
```

```
                operatingChannelNumber          INTEGER,
                listOfNetworkID                 SEQUENCE OF NetworkID,
                …
}

ChClassInfo :: = SEQUENCE {
                availableChannelList            SEQUENCE OF INTEGER,
                restrictedChannelList           SEQUENCE OF INTEGER,
                protectedChannelList            SEQUENCE OF INTEGER,
                unclassifiedChannelList         SEQUENCE OF INTEGER,
                operatingChannelList            SEQUENCE OF OperatingChannelInfo,
                coexistenceChannelList          SEQUENCE OF OperatingChannelInfo,
                …

}

ChClassInfoList ::= SEQUENCE OF SEQUENCE{
   networkID    NetworkID,
   chClassInfo    ChClassInfo
}

ReqInfoDescr ::= SEQUENCE OF ENUMERATED{
   SINR,
….desiredBandwidth,
   desiredOccupancy,
   desiredQoS,
   desiredCoverage,
   channelNumber,
   …
}

ReqInfoValue ::= SEQUENCE OF SEQUENCE{
```

```
    reqInfoDescr    ReqInfoDescr,
    reqInfoValue    CHOICE{SINRValue    REAL, desiredBandwidthValue    REAL,
                           desiredOccupancyValue    REAL, desiredQoSValue    REAL,
                           desiredCoverageValue    REAL, channelNumberValue    REAL,
                           otherValue    ANY}
}

MeasSchedule ::= SEQUENCE {
    measStartTime                REAL,
    numberOfMeasurements         INTEGER,
    timeBetweenMeasurements      REAL
}

MeasFreq ::= SEQUENCE{
    measStartAFreq    REAL OPTIONAL,
    measEndFreq    REAL OPTIONAL,
    listOfChNumber    SEQUENCE OF INTEGER OPTIONAL
}

MeasurementDescription ::= SEQUENCE OF SEQUENCE{
    measDescr    ENUMERATED{SINR, BER, SensingLevel, PrimaryDetection, TVBDDetection,
                            ChannelLoadMeasurement, …},
    measSchedule    MeasSchedule,
    measFreq    MeasFreq
}

MeasurementResult ::= SEQUENCE OF SEQUENCE{
    reqInfoDescr    ReqInfoDescr,
```

```
    reqInfoValue    CHOICE{SINRValue    REAL, BERValue    REAL,
                           SensingLevelValue    REAL, PrimaryDetectionValue BOOLEAN,
                           TVBDDetectionValue BOOLEAN, ChannelLoadMeasurementValue REAL,
                           otherValue    ANY}
}

TxSchedule ::= SEQUENCE {
    scheduleStartTime                REAL,
    scheduleDuration                 REAL,
    numberOfScheduleRepetitions      INTEGER,
    transmissionStartTime            REAL,
    transmissionDuration             REAL
}

ReconfigurationRequest ::= SEQUENCE OF SEQUENCE {
    operatingFrequency    SEQUENCE{startFeq    REAL, stopFreq    REAL} OPTIONAL,
    listOfOperatingChNumber    SEQUENCE OF INTEGER OPTIONAL,
    txPowerLimit           REAL OPTIONAL,
    channelIsShared        BOOLEAN,
    txSchedule             SEQUENCE OF TxSchedule OPTIONAL,
    networkTechnology      NetworkTechnology,
}

FailedParameterID : : = ENUMERATED {
                operatingFrequency,
                listOfoperatingChNumber,
                txPowerLimit,
                channelIsShared,
                txSchedule,
}
```

```
FailedParameterValue : : = CHOICE{
                operatingFrequency              SEQUENCE{startFeq    REAL, stopFreq    REAL},
                listOfoperatingChNumber         SEQUENCE OF INTEGER,
                txPowerLimit                    REAL,
                channelIsShared                 BOOLEAN,
                txSchedule                      SEQUENCE OF TxSchedule OPTIONAL
}

FailedParameter : : = SEQUENCE{
                failedParameterID               FailedParameterID,
                failedParameterValue            FailedParameterValue
}

FailedParameters : : = SEQUENCE OF FailedParameter


EventDescr ::= ENUMERATED{
   SINRThresholdReached,
   QoSDegradation,
   MisLocatedTVBDDetected,
   …
}


MisLocatedTVBDDetectedInfo ::= SEQUENCE{
   networkID    NetworkID,
   listOfoperatingFrequency    SEQUENCE OF SEQUENCE{startFeq    REAL, stopFreq    REAL}
                               OPTIONAL,
   listOfChannelNumber    SEQUENCE OF INTEGER OPTIONAL
}


AddInfo ::= CHOICE{
   misLocatedTVBDDetectedInfo    MisLocatedTVBDDetectedInfo,
   …
}


EventParams ::= SEQUENCE{
```

```
    eventDescr    EventDescr,

    addInfo       AddInfo OPTIONAL

}


GuranteedQoSOfWiredConnection:: = ENUMERATED{
                    CHOICE{xDSL, OpticalFibre, Others},
                    GuranteedMinimumBitRates,
                    GuranteedMaximumLatency OPTIONAL,
                    …
}
```