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Wireless Coexistence Working Group

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Source	Hyunduk Kang, Donghun Lee, Byung-Jang Jeong, Heonjin Hong, Jaeick Choi ETRI, 138 Gajeong-Ro, Yuseong-Gu, Daejeon, 305-700, South Korea, +82-42-860-1074, +82-42-860-0865, +82-42-860-6765, +82-42-860-4860, +82-42-860-6160 henry@etri.re.kr, mmdang@etri.re.kr, bjjeong@etri.re.kr, hjhong@etri.re.kr, jichoi@etri.re.kr Stanislav Filin, Junyi Wang, M. A. Rahman, Chen Song, Hiroshi Harada NICT, 3-4 Hikarino-oka, Yokosuka, Kanagawa, Japan, 239-0847 sfilin@nict.go.jp, junyi.wang@nict.go.jp, aziz@nict.go.jp, songe@nict.go.jp, harada@nict.go.jp Jari Junell, Mika Kasslin Nokia, Itämerenkatu 11-13, 00180 Helsinki, Finland jari.junell@nokia.com, mika.kasslin@nokia.com Päivi Ruuska Nokia, Visiokatu 1, 33720 Tampere, Finland paivi.m.ruuska@nokia.com Junho Jo, Bonghoe Kim, Jihyun Lee, Suhwook Kim LG Electronics, Inc., LG R&D Complex 533, Hogye-1dong, Dongan-Gu, Anyang-Shi, Kyungki-Do, 431-749, Korea +82-31-450-1911, +82-31-450-4131, +82-31-450-1860, +82-31-450-1936 Junho.jo@lge.com, Bonghoe.kim@lge.com, Jihyun1220.lee@lge.com, Suhwook.kim@lge.com Ryo Sawai, Naotaka Sato, Ryota Kimura Sony corporation, 5-1-12, Kitashinagawa, Shinagawa-ku, Tokyo 141-0001 Japan +81-3-5448-4018, +81-3-5448-4005, +81-3-5448-4018 Ryo.Sawai@jp.sony.com, Naotaka.sato@ieee.org, Ryota.Kimura@jp.sony.com Guo Xin Sony China, Room 701, Raycom Infotech Park Tower C, No.2 Kexueyuan South Road, Zhongguancun, HaiDian District, Beijing 100080, P.R.C. +86-10-8286-1668 Xin.Guo@sony.com.cn
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5. IEEE 802.19.1 reference model

5.1 General description

Figure 1 illustrates reference model of a Coexistence Enabler.

```
        ┌─────────COEX_MEDIA_SAP─────────┐
        │                                │
        │                                │
        │       Coexistence Enabler      │
        │                                │
        │         COEX_TR_SAP            │
        └────────────────────────────────┘
```
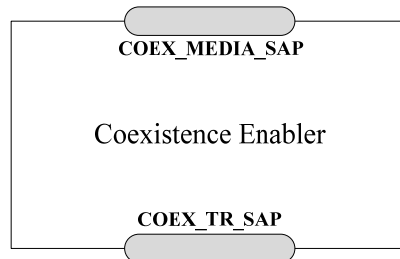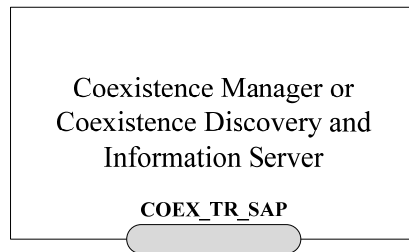
Figure 1—Reference model of a Coexistence Enabler

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.

```
        ┌────────────────────────────────┐
        │                                │
        │      Coexistence Manager or     │
        │     Coexistence Discovery and   │
        │       Information Server        │
        │                                │
        │          COEX_TR_SAP           │
        └────────────────────────────────┘
```

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.
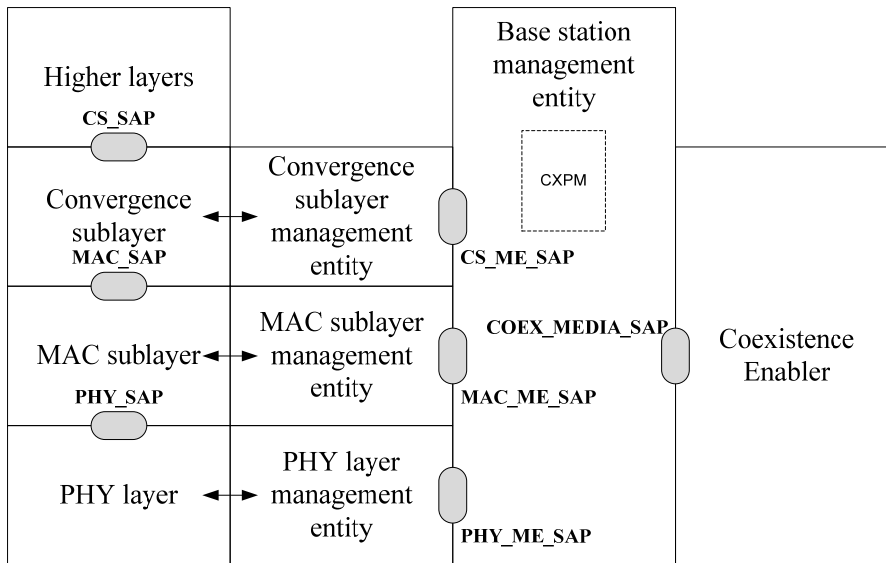
Figure 3— Example reference model for the interface A

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
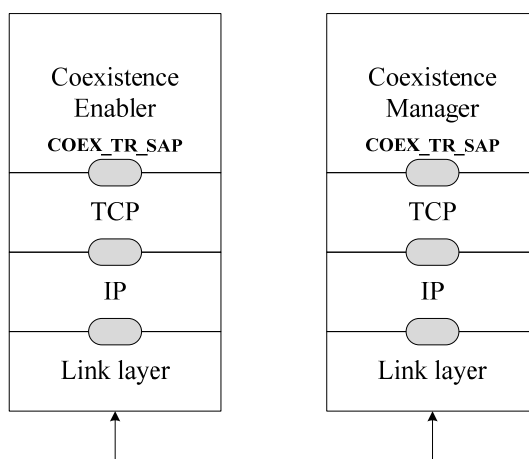
5.2.1 COEX_TR_SAP

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.

1 Transport service

2 5.2.1.1.1 CP_PACKET_SEND.request

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

8   transportPref,

9   sourceID,

10   destinationID,

11   coexProtocolPDU

12)

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.

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

19 5.2.1.1.2 CP_PACKET_SEND.confirm

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

25   transportPref,

26   sourceID,

27   destinationID,

28   transportStatus

29)

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

1 — Used by the coexistence system to ask TVBD network or device to change its subscribed
2 coexistence service.
3 — Registration service
4 — Used by the TVBD network or device to provide its registration information to the coexistence
5 system and to update this registration information
6 — Information service
7 — Used by the CE to send a neighbor report to the TVBD network or device subscribed to the
8 coexistence information service
9 — Used by the CE to obtain an available channel list from the TVBD network or device subscribed to
10 the coexistence management service
11 — Used by the CE to obtain information required for coexistence from the TVBD network or device
12 subscribed to the coexistence management service
13 — Used by the TVBD network or device to obtain channel classification information from the
14 coexistence system
15 — Measurement service
16 — Used by the CE to obtain measurement results required for coexistence from the TVBD network or
17 device subscribed to the coexistence management service
18 — Reconfiguration service
19 — Used by the CE to request the TVBD network or device subscribed to the coexistence management
20 service to perform reconfiguration required for coexistence
21 — Used by TVBD network or device to request for resource
22 — Event service
23 — Used by the CE and TVBD network or device to exchange indications of events related to
24 coexistence.
25 Primitives described in Table 2 are used to define the Coexistence Media SAP.

26 **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

1 **Authentication service**

2 **5.2.2.1.1 GetAuthInfo**

3 **5.2.2.1.1.1 GetAuthInfo.request**

4 *Function*
5 Used by a CE to request authentication information from the TVBD network or device.

6 *Semantics*
7 GetAuthInfo.request()

8 *When generated*
9 Generated by the CE to obtain authentication information from the TVBD network or device.

10 *Effect on receipt*
11 When the TVBD network or device receives this primitive, it sends a GetAuthInfo.response back to the CE.

12 **5.2.2.1.1.2 GetAuthInfo.response**

13 *Function*
14 Used by the TVBD network or device to provide the authentication information to the CE.

1 *Semantics*

2 GetAuthInfo.response (

3   UserID

4   UserPassword

5)

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.

6 *When generated*

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

8 *Effect on receipt*

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

11 **5.2.2.1.1.3 GetAuthInfo.confirm**

12 *Function*

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

14 *Semantics*

15 GetAuthInfo.confirm(

16   status

17)

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

18 *When generated*

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

21 *Effect on receipt*

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

1 **Subscription service**

2 **5.2.2.1.2 GetServiceSubscription**

3 **5.2.2.1.2.1 GetServiceSubscription.request**

4 *Function*
5 Used by a CE to obtain subscription information from the TVBD network or device.

6 *Semantics*
7   GetServiceSubscription.request()

8 *When generated*
9 Generated by the CE to request the TVBD network or device to indicate the coexistence service which it
10 wants to receive from the coexistence system.

11 *Effect on receipt*
12 When the TVBD network or device receives this primitive, it sends a GetServiceSubscription.response
13 back to the CE.

14 **5.2.2.1.2.2 GetServiceSubscription.response**

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

18 *Semantics*
19 GetServiceSubscription.response (

20   subscribedService

21   )

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

22 *When generated*
23 Generated by the TVBD network or device in response to a GetServiceSubscription.request from the CE.

24 *Effect on receipt*
25 When CE receives this primitive, it requests a service subscription from a CM.

26 **5.2.2.1.2.3 GetServiceSubscription.confirm**

27 *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.

1 **5.2.2.1.3 ChangeSubscription**

2 **5.2.2.1.3.1 ChangeSubscription.request**

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

5 *Semantics*
6 ChangeSubscription.request(

7   newSubscribedService

8)

Name	Type	Description
newSubscribedService	SubscribedService	Proposed new subscribed coexistence service

9 *When generated*
10 Generated by the CE when it needs to ask the TVBD network or device to change its subscription to the
11 coexistence services.

12 *Effect on receipt*
13 When TVBD network or device receives this primitive, it shall send ChangeSubscription.response back to
14 CE.

15 **5.2.2.1.3.2 ChangeSubscription.response**

16 *Function*
17 Used by the TVBD network or device accept/reject the request to change its subscription to the coexistence
18 services.

19 *Semantics*
20 ChangeSubscription.request(

21   status

22)

Name	Type	Description
status	BOOLEAN	Status: accepted or not

23 *When generated*
24 Generated by the TVBD network or device in response to the ChangeSubscription.request from the CE.

25 *Effect on receipt*
26 When the CE receives this primitive it reports the status to the CM.

1 Registration service

2 5.2.2.1.4 GetRegInfo

3 5.2.2.1.4.1 GetRegInfo.request

4 *Function*
5 Used by a CE to request the TVBD network or device to provide registration information.

6 *Semantics*
7 GetRegInfo.request ( )

8 *When generated*
9 Generated by the CE to request the TVBD network or device to provide registration information.

10 *Effect on receipt*
11 When the TVBD network or device receives this primitive, it shall send a GetRegInfo.response back to the
12 CE.

13 5.2.2.1.4.2 GetRegInfo.response

14 *Function*
15 Used by the TVBD network or device to provide requested registration information to CE.

16 *Semantics*
17 GetRegInfo.response (

18   networkID,

19   networkTechnology,

20   networkType,

21   discoveryInformation,

22   ACLR,

23   ACS,

24   guranteedQoSOfBackhaulConnection,

25   listOfSupportedFrequencies,

26   listOfSupportedChNumber

27   minTxPower,

28   txScheduleSupported,

1   networkTechnologyReconfigurationSupported,

2   addNetworkTechnology,

3   listOfOperatingFrequencies,

4   listOfOperatingChNumber,

5   radioEnvironmentInformation OPTIONAL,

6   requiredResource

7   )

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

1   *When generated*

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

3   *Effect on receipt*

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

5   **5.2.2.1.5 NewRegInfo**

6   **5.2.2.1.5.1 NewRegInfo.indication**

7   *Function*

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

9   *Semantics*

10   NewRegInfo.indication (

11   networkID,

12   networkTechnology,

13   networkType,

14   discoveryInformation,

15   ACLR,

16   ACS,

17   guranteedQoSOfBackhaulConnection,

18   listOfSupportedFrequencies,

1   listOfSupportedChNumber,

2   minTxPower,

3   txScheduleSupported,

4   networkTechnologyReconfigurationSupported,

5   addNetworkTechnology,

6   listOfOperatingFrequencies,

7   listOfOperatingChNumber,

8   radioEnvironmentInformation OPTIONAL,

9   requiredResource

10   )

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.

1 *Effect on receipt*

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

3 **5.2.2.1.6.2 NeighborReport.response**

4 *Function*

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

7 *Semantics*

8 NeighborReport.response(

9 neighborReport

10)

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

11 *When generated*

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

13 *Effect on receipt*

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

16 **5.2.2.1.6.3 NeighborReport.indication**

17 *Function*

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

20 *Semantics*

21 NeighborReport.indication (

22 neighborReport

23)

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

24 *When generated*

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

1 *Effect on receipt*

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

4 **5.2.2.1.7 AvailableChannelList**

5 **5.2.2.1.7.1 AvailableChannelList.request**

6 *Function*

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

8 *Semantics*

9   AvailableChannelList.request()

10 *When generated*

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

12 *Effect on receipt*

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

15 **5.2.2.1.7.2 AvailableChannelList.response**

16 *Function*

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

18 *Semantics*

19 AvailableChannelList.response (

20   availableChannelList,

21   listOfAllowedTVWSChNumber,

22   constOfChUses

23)

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

24 *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

1)

Name	Type	Description
chClassInfoList	ChClassInfoList	Channel classification information list

2 **When generated**

3 Generated by the CE if channel classification information has changed.

4 **Effect on receipt**

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

7 **5.2.2.1.9 GetInfo**

8 **5.2.2.1.9.1 GetInfo.request**

9 **Function**

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

11 **Semantics**

12 GetInfo.request(

13   reqInfoDescr

14)

Name	Type	Description
reqInfoDescr	ReqInfoDescr	Requested information ID.

15 **When generated**

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

17 **Effect on receipt**

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

19 **5.2.2.1.9.2 GetInfo.response**

20 **Function**

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

22 **Semantics**

23 GetRegInfo.response (

24   reqInfoValue

1)

Name	Type	Description
reqInfoValue	ReqInfoValue	Requested information

2 *When generated*

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

4 *Effect on receipt*

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

6 **Measurement service**

7 **5.2.2.1.10 GetMeasurement**

8 **5.2.2.1.10.1 GetMeasurement.request**

9 *Function*

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

11 *Semantics*

12 GetMeasurement.request(

13   measurementDescription

14)

Name	Type	Description
measurementDescription	MeasurementDescription	Measurement Description

15 *When generated*

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

17 *Effect on receipt*

18 When the TVBD network or device receives this primitive, it performs measurements required by the CE

19 and responds back either with a GetMeasurement.response or a GetMeasurement.indication.

20 **5.2.2.1.10.2 GetMeasurement.response**

21 *Function*

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

23 *Semantics*

24 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.

1 *Semantics*

2 PerformReconfiguration.request(

3   reconfigurationRequest,

4   chClassInfo

5)

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

6 *When generated*

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

8 *Effect on receipt*

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

11 **5.2.2.1.11.2 PerformReconfiguration.response**

12 *Function*

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

14 *Semantics*

15 PerformReconfiguration.response (

16   reconfigurationStatus,

17   failedParameters

18)

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.

19 *When generated*

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

21 *Effect on receipt*

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

1 **5.2.2.1.12 ResourceReconfiguration**

2 **5.2.2.1.12.1 ResourceReconfiguration.request**

3 *Function*
4 Used by a TVBD network or device to request resource.

5 *Semantics*
6 ResourceReconfiguration.request(

7   networkType,

8   Geolocation,

9   ChannelNumber,

10   startFreq,

11   endFreq,

12   MaximumPowerLevel,

13   ChannelLoad

14   )

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

15 *When generated*
16 Generated by the TVBD network or device to request new resource.

17 *Effect on receipt*

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

1 **5.2.2.1.12.2 ResourceReconfiguration.response**

2 *Function*
3 Used by a CE to provide resource reconfiguration to the TVBD network or device.

4 *Semantics*
5 ResourceReconfiguration.response(

6   ChannelNumber,

7   startFreq,

8   endFreq,

9   MaximumPowerLevel

10)

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

11 *When generated*
12 Generated by the CE to allocate resources to the TVBD network or device.

13 *Effect on receipt*

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

15 **Event service**

16 **5.2.2.1.13 Event**

17 **5.2.2.1.13.1 Event.indication**

18 *Function*
19 Used by a TVBD network or device to inform the CE about events related to coexistence observed or
20 predicted by the TVBD network or device.
21 Also, used by a CE to inform the TVBD network or device about events related to coexistence observed or
22 predicted by the coexistence system.
23 *Semantics*
24 Event.indication(

1   eventParams

2   )

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

3 *When generated*

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

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

8 *Effect on receipt*

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

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

13 **5.3 Data type definition**

14 **5.3.1 COEX_TR_SAP**

15 TransportPref ::= ENUMERATED{

16   TCP,

17   UDP,

18   HTTP,

19   SNMP,

20   …

21   }

22 **5.3.2 COEX_MEDIA_SAP**

23 SubscribedService::= ENUMERATED{

24   information,

25   management

26

27   }

1

2 NetworkID::= ENUMERATED{

3   BSSID,

4   …

5 }

6

7 NetworkTechnology ::= ENUMERATED{

8   IEEE802.11af,

9   IEEE802.22,

10   ECMA392,

11   …

12 }

13

14 NetworkType ::= ENUMERATED{

15   fixed,

16   mode2,

17   …

18 }

19

20 DiscoveryInformation ::= SEQUENCE{

21   coordinateX   REAL,

22   coordinateY   REAL,

23   coordinateZ   REAL,

24   maxTxPower   REAL,

25   rxSensitivity   REAL,

26   antennaGain   REAL,

27   minReqSNR   REAL,

28   TolerableInterferenceLevel   REAL,

1   antennaHeight   REAL,

2   …

3   }

4

5   ListOfSupportedFrequencies ::= SEQUENCE OF SEQUENCE{

6   startFreq   REAL,

7   stopFreq   REAL

8   }

9

10   ListOfOperatingFrequencies ::= SEQUENCE OF SEQUENCE{

11   startFreq   REAL,

12   stopFreq   REAL,

13   occupancy   REAL,

14   totalOccupancy   REAL OPTIONAL

15   }

16

17   FreqDescription ::= SEQUENCE{

18   networkID   NetworkID   OPTIONAL,

19   networkTechnology   NetworkTechnology   OPTIONAL,

20   coexType   ENUMERATED{known, unknown},

21   interferenceDirection   ENUMERATED{mutual, source, victim},

22   occupancy   REAL OPTIONAL,

23   totalOccupancy   REAL OPTIONAL

24   }

25

26   RadioEnvironmentInformation ::= SEQUENCE OF SEQUENCE{

27   startFreq   REAL,

28   stopFreq   REAL,

1   state   ENUMERATED{free, occupiedKnown, occupiedUnknown, notMeasured},

2   freqDescription   FreqDescription   OPTIONAL

3   }

4

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

6

7   NeighborReport ::= SEQUENCE OF SEQUENCE{

8   networkID   NetworkID,

9   networkTechnology   NetworkTechnology,

10   interferenceDirection   ENUMERATED{mutual, source, victim},

11   interferenceLevelFromNeighbor REAL,

12   interferenceLevelToNeighbor   REAL,

13   listOfOperatingChannelNumber   SEQUENCE OF INTEGER   OPTIONAL,

14   listOfOperatingFrequencies   ListOfOperatingFrequencies   OPTIONAL,

15   radioEnvironmentInformation   RadioEnvironmentInformation   OPTIONAL,

16   networkGeometryClass   NetworkGeometryClass

17   }

18

19   AggregatedInterferferenceControlParameters :: = SEQUENCE{
20   ReferencePointID   INTEGER,
21   Geolocation   ReferencePointGeolocation,
22   ACS   REAL,
23   Antenna height   REAL,
24   Antenna gain   REAL,
25   Protection ratio   REAL,
26   …
27   }
28
29   ReferencePointGeolocation :: = ENUMERATED {
30   Latitude   REAL,
31   Longitude   REAL,
32   Altitude   REAL,
33   …
34   }
35

36   AvailableChannelList::= SEQUENCE OF SEQUENCE{

```
1      startFreq        REAL,

2      stopFreq         REAL,

3      txPowerLimit     REAL,

4      aggregatedInterferenceControlParameters     AggregatedInterferenceControlParameters

5      }

6

7    RequiredResource ::= SEQUENCE OF SEQUENCE{

8      requiredBandwidth    REAL,

9      expectedLoad         REAL

10     }

11

12   ListOfAllowedTVWSChNumber ::= SEQUENCE OF INTEGER

13

14   ConstOfChUseID :: = ENUMERATED{
15              regulationMaxTxPower,
16              regulationMaxAntGain,
17              regulationMaxAntHeight,
18              regulationTVDBUpdateTime,
19              OutOfBandEmissionLimit,
20              …
21     }
22

23   ConstOfChUseValue :: = CHOICE{
24              regulationMaxTxPower                 REAL,
25              regulationMaxAntMaxGain              REAL,
26              regulationAntMaxHeight               REAL,
27              regulationTVDBUpdateTime             REAL,
28              OutOfBandEmissionLimit               REAL,
29              …
30     }
31
32   ConstOfChUse : : = SEQUENCE{

33              constOfChUseID              ConstOfChUseID,
34              constOfChUseValue           ConstOfChUseValue
35     }
36
37   ConstOfChUses : : = SEQUENCE OF ConstOfChUse
38

39   OperatingChannelInfo :: =  SEQUENCE {
```

```
1               operatingChannelNumber          INTEGER,

2               listOfNetworkID                 SEQUENCE OF NetworkID,

3               …

4   }

5


6   ChClassInfo :: = SEQUENCE {
7               availableChannelList            SEQUENCE OF INTEGER,
8               restrictedChannelList           SEQUENCE OF INTEGER,
9               protectedChannelList            SEQUENCE OF INTEGER,
10              unclassifiedChannelList         SEQUENCE OF INTEGER,
11              operatingChannelList            SEQUENCE OF OperatingChannelInfo,
12              coexistenceChannelList          SEQUENCE OF OperatingChannelInfo,
13              …
14
15  }

16

17  ChClassInfoList ::= SEQUENCE OF SEQUENCE{

18      networkID    NetworkID,

19      chClassInfo    ChClassInfo

20  }

21

22  ReqInfoDescr ::= SEQUENCE OF ENUMERATED{

23      SINR,

24  ….desiredBandwidth,

25      desiredOccupancy,

26      desiredQoS,

27      desiredCoverage,

28      channelNumber,

29      …

30  }

31

32  ReqInfoValue ::= SEQUENCE OF SEQUENCE{
```

1 reqInfoDescr   ReqInfoDescr,

2 reqInfoValue   CHOICE{SINRValue   REAL, desiredBandwidthValue   REAL,

3   desiredOccupancyValue   REAL, desiredQoSValue   REAL,

4   desiredCoverageValue   REAL, channelNumberValue   REAL,

5   otherValue   ANY}

6 }

7

8 MeasSchedule ::= SEQUENCE {

9   measStartTime   REAL,

10   numberOfMeasurements   INTEGER,

11   timeBetweenMeasurements   REAL

12   }

13

14 MeasFreq ::= SEQUENCE{

15   measStartAFreq   REAL OPTIONAL,

16   measEndFreq   REAL OPTIONAL,

17   listOfChNumber   SEQUENCE OF INTEGER OPTIONAL

18   }

19

20 MeasurementDescription ::= SEQUENCE OF SEQUENCE{

21   measDescr   ENUMERATED{SINR, BER, SensingLevel, PrimaryDetection, TVBDDetection,

22   ChannelLoadMeasurement, …},

23   measSchedule   MeasSchedule,

24   measFreq   MeasFreq

25   }

26

27 MeasurementResult ::= SEQUENCE OF SEQUENCE{

28   reqInfoDescr   ReqInfoDescr,

```
1    reqInfoValue    CHOICE{SINRValue    REAL, BERValue    REAL,

2                         SensingLevelValue    REAL, PrimaryDetectionValue BOOLEAN,

3                         TVBDDetectionValue BOOLEAN, ChannelLoadMeasurementValue REAL,

4                         otherValue    ANY}

5    }

6

7    TxSchedule ::= SEQUENCE {

8      scheduleStartTime              REAL,

9      scheduleDuration              REAL,

10     numberOfScheduleRepetitions    INTEGER,

11     transmissionStartTime          REAL,

12     transmissionDuration           REAL

13   }

14

15   ReconfigurationRequest ::= SEQUENCE OF SEQUENCE {

16     operatingFrequency    SEQUENCE{startFeq    REAL, stopFreq    REAL} OPTIONAL,

17     listOfOperatingChNumber    SEQUENCE OF INTEGER OPTIONAL,

18     txPowerLimit            REAL OPTIONAL,

19     channelIsShared        BOOLEAN,

20     txSchedule              SEQUENCE OF TxSchedule OPTIONAL,

21     networkTechnology     NetworkTechnology,

22   }

23

24   FailedParameterID : : = ENUMERATED {
25                 operatingFrequency,
26                 listOfoperatingChNumber,
27                 txPowerLimit,
28                 channelIsShared,
29                 txSchedule,
30   }
31
32
```

```
1    FailedParameterValue : : = CHOICE{
2              operatingFrequency            SEQUENCE{startFeq  REAL, stopFreq  REAL},
3              listOfoperatingChNumber       SEQUENCE OF INTEGER,
4              txPowerLimit                  REAL,
5              channelIsShared               BOOLEAN,
6              txSchedule                    SEQUENCE OF TxSchedule OPTIONAL
7    }
8
9    FailedParameter : : = SEQUENCE{
10             failedParameterID             FailedParameterID,
11             failedParameterValue          FailedParameterValue
12   }
13
14   FailedParameters : : = SEQUENCE OF FailedParameter
15
16   EventDescr ::= ENUMERATED{

17     SINRThresholdReached,

18     QoSDegradation,

19     MisLocatedTVBDDetected,

20     …

21   }

22

23   MisLocatedTVBDDetectedInfo ::= SEQUENCE{

24     networkID   NetworkID,

25     listOfoperatingFrequency   SEQUENCE OF SEQUENCE{startFeq   REAL, stopFreq   REAL}

26                      OPTIONAL,

27     listOfChannelNumber    SEQUENCE OF INTEGER OPTIONAL

28   }

29

30   AddInfo ::= CHOICE{

31     misLocatedTVBDDetectedInfo   MisLocatedTVBDDetectedInfo,

32     …

33   }

34

35   EventParams ::= SEQUENCE{
```

```
    eventDescr   EventDescr,

    addInfo       AddInfo OPTIONAL

  }


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