IEEE P802.19

Wireless Coexistence Working Group

Project	IEEE 802.19 Wireless Coexistence Working Group (WG)
Title	Proposal to System Description and Reference Model clauses
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Re:	
Abstract	This file contains proposal to System Description and Reference Model clauses in response to Call for Proposals (P802.19-10/57r2). It uses IEEE draft standard template.
Purpose	To propose text for System Description and Reference Model clauses of P802.19.1 draft standard
Notice	
Release	

Contents

TV White Space Coexistence Methods

1. Overview

1.1 Scope

The standard specifies radio technology independent methods for coexistence among dissimilar or independently operated TV Band Device (TVBD) networks and dissimilar TV Band Devices

1.2 Purpose

The purpose of the standard is to enable the family of IEEE 802 Wireless Standards to most effectively use TV White Space by providing standard coexistence methods among dissimilar or independently operated TVBD networks and dissimilar TVBDs. This standard addresses coexistence for IEEE 802 networks and devices and will also be useful for non IEEE 802 networks and TVBDs.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

3. Definitions, Abbreviations and Acronyms

3.1 Definitions

3.2 Abbreviations and Acronyms

4. System Description

4.1 System Architecture

The 802.19.1 system architecture has three logical entities and five logical interfaces. An 802.19.1 logical entity is defined by its functional role(s) and its interfaces with other 802.19.1 logical entities and with external elements.

Three logical entities are:

— Coexistence Manager (CM)
— Coexistence Enabler (CE)
— Coexistence Discovery and Information Server (CDIS).

Five logical interfaces are:

— Interface A
— Interface B1
— Interface B2
— Interface B3
— Interface C.

The 802.19.1 system interacts with two external elements:

— TVWS database
— TVBD network or device.

Figure 1 shows 802.19.1 system architecture.

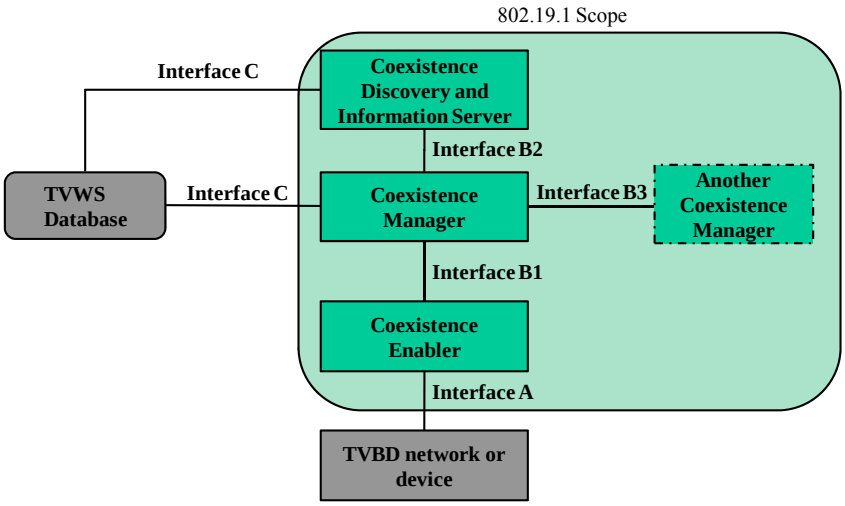

Figure 1 System Architecture

4.2 Logical entities

4.2.1 Coexistence Enabler

Coexistence Enabler has the following functional roles:

- Obtain information required for coexistence from TVBD network or device and provide it to CM
- Provide information required for coexistence (generated by IEEE 802.19.1 system or obtained by IEEE 802.19.1 system from external entities) to TVBD network or device
- Facilitate sharing of information required for coexistence among TVBD networks or devices via the IEEE 802.19.1 system
- Request TVBD network or device to perform measurements required for coexistence by itself or according to commands received from CM
- Obtain measurement results required for coexistence from TVBD network or device and provide them to CM
- Request TVBD network or device to perform reconfiguration required for coexistence according to commands received from CM
- Receive information about observed or predicted events related to coexistence from TVBD network or device and provide it to CM
- Provide information about observed or predicted events related to coexistence (generated by IEEE 802.19.1 system) to TVBD network or device.

4.2.2 Coexistence Manager

Coexistence Manager has the following functional roles:

- Coexistence decision making
- Discovery of other CMs
- Support exchange of information required for coexistence among CMs

— Support sharing of information required for coexistence among TVBD networks or devices.

4.2.3 Coexistence Discovery and Information Server

Coexistence Discovery and Information Server has the following functional roles:

— Support discovery of CMs
— Collect, store, aggregate, and provide information required for coexistence
— Support exchange of information required for coexistence among CMs
— Support sharing of information required for coexistence among TVBD networks or devices.

4.3 Logical Interfaces

Five logical interfaces defined in the 802.19.1 system architecture can be split into three groups:

— Interfaces between 802.19.1 entities:
  — Interface B1
  — Interface B2
  — Interface B3
— Interface between an 802.19.1 entity and TVBD network/device:
  — Interface A
— Interface between 802.19.1 entities and TVWD database:
  — Interface C.

Different interfaces in each group are distinguished by their usage, types of information exchanged, and underlying protocols.

4.3.1 Interface A

Interface A between CE and TVBD network or device is used to transmit the following:

— From TVBD network or device to CE:
  — Information required for coexistence
  — Measurement results required for coexistence
  — Information about observed or predicted events related to coexistence
— From CE to TVBD network or device:
  — Information required for coexistence (generated by IEEE 802.19.1 system or obtained by IEEE 802.19.1 system from external entities)
  — Measurement requests required for coexistence
  — Reconfiguration requests required for coexistence
  — Information about observed or predicted events related to coexistence (generated by IEEE 802.19.1 system).

4.3.2 Interface B1

Interface B1 between CE and CM is used to transmit the following:

- From CE to CM:
  - Information required for coexistence
- From CM to CE:
  - Reconfiguration commands required for coexistence.

4.3.3 Interface B2

Interface B2 between CM and CDIS is used to transmit the following:

- From CM to CDIS:
  - Information required for discovery
  - Information required for coexistence
- From CDIS to CM:
  - Information required for discovery
  - Information required for coexistence.

4.3.4 Interface B3

Interface B3 between different CMs is used to transmit the following:

- Information required for coexistence.

4.3.5 Interface C

Interface C between CM and TVWS database or between CDIS and TVWS database is used to transmit the following:

- From TVWS database:
  - Information required for coexistence.

5. IEEE 802.19.1 reference model

5.1 General description

Figure 2 illustrates reference model of Coexistence Enabler.

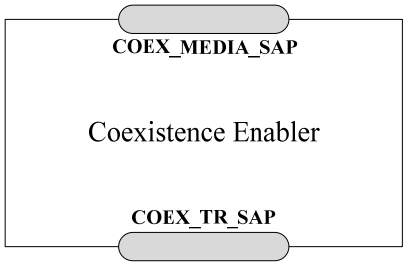

Figure 2 Reference model of Coexistence Enabler

Coexistence Enabler has two service access points:

— Coexistence Media SAP (COEX_MEDIA_SAP)

— Coexistence Transport SAP (COEX_TR_SAP).

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

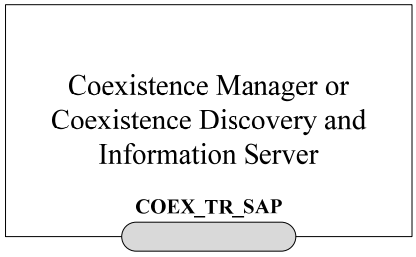

Figure 3 Reference model of Coexistence Manager and Coexistence Discovery and Information Server

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

— Coexistence Transport SAP (COEX_TR_SAP).

COEX_MEDIA_SAP defines the interface A between CE and TVBD network/device. Example reference model of CE describing example implementation of interface A inside a base station is shown in Figure 4.

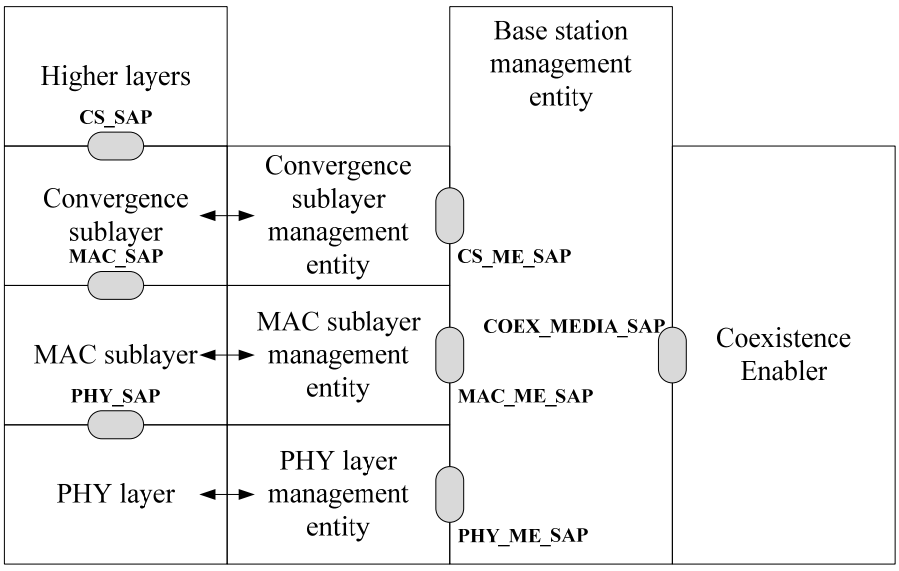

Figure 4 Example reference model for interface A

The left side of Figure 4 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 4 shows base station management entity. The right part of Figure 4 shows CE.

Typically, radio interface is implemented in such a way that it provides management interface for base station management entity. In Figure 4, 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_MEDIA_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.

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.

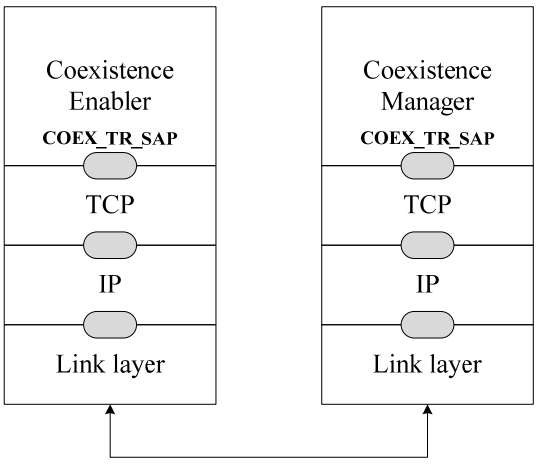

Figure 5 Example of using COEX_TR_SAP for interface B1

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.

5.2 Service access points

5.2.1 Coexistence Media SAP

5.2.1.1 General description

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

— 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 networks/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 Media SAP.

Table 1 – Coexistencre Media SAP primitives

Primitive	Service	Description
COEX_INFO_OBTAINING	Information	Used by CE to obtain information required for coexistence from TVBD network/device. Also, used by TVBD network/device to obtain information required for coexistence from CE.
COEX_INFO_SHARING	Information	Used by TVBD network/device to identify the capability of sharing information to other TVBD networks/devices via the IEEE 802.19.1 system.
COEX_INFO_PROVISION	Information	Used by TVBD network/device to provide information to the IEEE 802.19.1 system for sharing with other TVBD networks/devices.
COEX_RCF	Reconfiguration	Used by CE to request reconfiguration of TVBD networks/devices required for coexistence.
COEX_MEAS	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.

5.2.1.2 Information service

5.2.1.2.1 COEX_INFO_OBTAINING

5.2.1.2.1.1 COEX_INFO_OBTAINING.request

Function

Used by CE to request information required for coexistence from TVBD network/device.

Also, used by TVBD network/device to request information required for coexistence from CE.

Semantics

COEX_INFO_OBTAINING.request(

    CoexInfoParamIds

)

Name	Type	Description
CoexInfoParamIds	COEX_I_PARAM_IDs	This parameter contains list of information parameter IDs requested by CE.

When generated

Generated by CE to request information required for coexistence from TVBD network/device.

Generated by TVBD network/device to request information required for coexistence from CE.

Effect on receipt

When TVBD network/device receives this primitive, the TVBD network/device shall send COEX_INFO_OBTAINING.confirm back to the CE.

When CE receives this primitive, CE shall send COEX_INFO_OBTAINING.confirm back to the TVBD network/device.

5.2.1.2.1.2 COEX_INFO_OBTAINING.confirm

Function

Used by TVBD network/device to provide information required for coexistence to CE.

Used by CE to provide information required for coexistence to TVBD network/device.

Semantics

COEX_INFO_OBTAINING.confirm(

CoexInfoParams

)

Name	Type	Description
CoexInfoParams	COEX_I_PARAMs	This parameter contains list of information parameters requested by CE.

When generated

Generated by TVBD network/device in response to COEX_INFO_OBTAINING.request from CE.

Generated by CE in response to COEX_INFO_OBTAINING.request from TVBD network/device.

Effect on receipt

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

When TVBD network/device receives this primitive, it examines the received information required for coexistence.

5.2.1.2.2 COEX_INFO_SHARING

5.2.1.2.2.1 COEX_INFO_SHARING.request

Function

Used by TVBD network/device to identify the capability of sharing information to other TVBD networks/devices via the IEEE 802.19.1 system.

Semantics

COEX_INFO_SHARING.request(

InfoDestination,

CoexInfoParamIds

)

Name	Type	Description
InfoDestination	INFO_DEST	This parameter contains list of destinations to which

		TVBD network/device would like to provide information for sharing with other TVBD networks/devices.
CoexInfoParamIds	COEX_I_PARAM_IDs	This parameter contains list of information parameter IDSs which TVBD network/device would like to share with other TVBD networks/devices.

When generated

Generated by TVBD network/device to initiate the procedure to share information with other TVBD networks/devices via the IEEE 802.19.1 system.

Effect on receipt

When CE receives this primitive, CE shall send COEX_INFO_SHARING.confirm back to the TVBD network/device.

5.2.1.2.2.2 COEX_INFO_SHARING.confirm

Function

Used by CE to inform TVBD network/device about the capability of sharing information to other TVBD networks/devices via the IEEE 802.19.1 system.

Semantics

COEX_INFO_SHARING.confirm(

CoexInfoParamIds

)

Name	Type	Description
CoexInfoParamIds	COEX_I_PARAM_IDs	This parameter contains list of information parameter IDs which IEEE 802.19.1 system can share with other TVBD networks/devices.

When generated

Generated by CE in response to COEX_INFO_SHARING.request from TVBD network/device.

Effect on receipt

When TVBD network/device receives this primitive, it examines the received information about the capability of sharing information to other TVBD networks/devices via the IEEE 802.19.1 system.

5.2.1.2.3 COEX_INFO_PROVISION

5.2.1.2.3.1 COEX_INFO_PROVISION.request

Function

Used by TVBD network/device to provide information to the IEEE 802.19.1 system for sharing with other TVBD networks/devices.

Semantics

COEX_INFO_PROVISION.request(

InfoDestination,

CoexInfoParams

)

Name	Type	Description
InfoDestination	INFO_DEST	This parameter contains list of destinations to which TVBD network/device provides information.
CoexInfoParams	COEX_I_PARAMs	This parameter contains list of information parameters which TVBD network/device is providing.

When generated

Generated by TVBD network/device to provide information to the IEEE 802.19.1 system for sharing with other TVBD networks/devices.

Effect on receipt

When CE receives this primitive, CE shall send COEX_INFO_PROVISION.confirm back to the TVBD network/device.

5.2.1.2.3.2 COEX_INFO_PROVISION.confirm

Function

Used by CE to inform TVBD network/device about the status of the request to provide information to the IEEE 802.19.1 system for sharing with other TVBD networks/devices.

Semantics

COEX_INFO_PROVISION.confirm(

InfoProvisionStatus

)

Name	Type	Description
InfoProvisionStatus	I_STATUS	This parameter describes the status of information provision request issued by the TVBD network/device.

When generated

Generated by CE in response to COEX_INFO_PROVISION.request from TVBD network/device.

Effect on receipt

When TVBD network/device receives this primitive, it examines the received information about the status of the request to provide information to the IEEE 802.19.1 system for sharing with other TVBD networks/devices.

5.2.1.3 Reconfiguration service

5.2.1.3.1 COEX_RCF

5.2.1.3.1.1 COEX_RCF.request

Function

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

Semantics

COEX_RCF.request(

CoexReconParams

)

Name	Type	Description
CoexReconParams	COEX_R_PARAMs	This parameter contains list of reconfiguration parameters according to which TVBD network/device shall perform reconfiguration.

When generated

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

Effect on receipt

When TVBD network/device receives this primitive, it performs corresponding reconfiguration. Then, TVBD network/device shall send COEX_RCF.confirm back to the CE.

5.2.1.3.1.2 COEX_RCF.confirm

Function

Used by TVBD network/device to inform CE about the results of the request to perform reconfiguration of TVBD networks/devices required for coexistence.

Semantics

COEX_RCF.confirm(

CoexReconResults

)

Name	Type	Description
CoexReconResutls	COEX_R_RESULTs	This parameter describes the result of the reconfiguration requested by the CE.

When generated

Generated by TVBD network/device in response to the COEX_RCF.request from CE.

Effect on receipt

When CE receives this primitive, it examines the received information about the status of the request to perform reconfiguration of TVBD networks/devices required for coexistence.

5.2.1.4 Measurement service

5.2.1.4.1 COEX_MEAS

5.2.1.4.1.1 COEX_MEAS.request

Function

Used by CE to request TVBD network/device to perform measurement required for coexistence.

Semantics

COEX_MEAS.request(

CoexMeasuParams

)

Name	Type	Description
CoexMeasuParams	COEX_M_PARAMs	This parameter contains list of measurement parameters according to which TVBD network/device shall perform measurement.

When generated

Generated by CE to request TVBD network/device to perform measurement required for coexistence.

Effect on receipt

When TVBD network/device receives this primitive, it performs requested measurement. Then, TVBD network/device shall send COEX_MEAS.confirm back to CE.

5.2.1.4.1.2 COEX_MEAS.confirm

Function

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

Semantics

COEX_MEAS.confirm(

CoexMeasuResults

)

Name	Type	Description
CoexMeasuResults	COEX_M_RESULTs	This parameter contains list of results of measurement performed by TVBD network/device

When generated

Generated by TVBD network/device in response to the COEX_MEAS.request from CE.

Effect on receipt

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

5.2.1.5 Event service

5.2.1.5.1 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

COEX_EVENT.indication(

CoexEventParams

)

Name	Type	Description
CoexEventParams	COEX_E_PARAMs	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.

5.2.2 Coexistence Transport SAP

5.2.2.1 General description

Coexistence Transport 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 Coexistence Transport 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 acknoledgement 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 2 are used to define the Coexistence Transport SAP.

Table 2 – Coexistencre Transport SAP primitives

Primitive	Service	Description
CP_PACKET_SEND	Transport	Used by 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 deliever a coexistence protocol data unit to CE, CM, CDIS or external entity.

5.2.2.2 Transport service

CP_PACKET_SEND

CP_PACKET_SEND.request

Function

Used by CE, CM, CDIS or 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	Type	Description
TransportPref	TRANSPORT_PREF	Transport protocol preference.
SourceID	TRANSPORT_ADDR	Address of the entity sending coexistence protocol data unit.
DestinationID	TRANSPORT_ADDR	Address of the entity to receive coexistence protocol data unit.
CoexProtocolPDU	OCTET_STRING	Coexistence protocol data unit to be transported.

When generated

Generated by CE, CM, CDIS or external entity to request the transport service provider to transport a coexistence protocol data unit.

Effect on receipt

The specific transport servce provider receiving this primitive attempts to transport the coexistence protocol data unit.

CP_PACKET_SEND.confirm

Function

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

CP_PACKET_SEND.confirm(

TransportPref,

SourceID,

DestinationID,

TransportStatus

)

Name	Type	Description
TransportPref	TRANSPORT_PREF	Transport protocol preference.
SourceID	TRANSPORT_ADDR	Address of the entity sending coexistence protocol data unit.
DestinationID	TRANSPORT_ADDR	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

Generated by the transport service provider to confirm delivery of coexistence protocol data if such acknowledgement is supported by the transport service provider.

Effect on receipt

When CE, CM, CDIS or external entity receives this primitive, it learns about the staus of the requested delivery of coexistence protocol data.

CP_PACKET_RECEIVE

Function

Used by transport service provider to deliver a coexistence protocol data unit to CE, CM, CDIS or external entity.

Semantics

CP_PACKET_RECEIVE(

TransportPref,

SourceID,

DestinationID,

CoexProtocolPDU

)

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

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 coexistence protocol data unit.

5.3 Data types

5.3.1 Coexistence Media SAP data types

The following data types are defined for Coexistence Media SAP.

5.3.1.1 Information service data types

The following data types are defined for information service of Coexistence Media SAP.

```
I_PARAM_ID ::= ENUMERATED{
   BSSID,
   SSID,
   BSSType,
   BeaconPeriod,
   DTIMPeriod,
   Timestamp,
   LocalTime,
   PHYParameterSet,
   CFParameterSet,
   IBSSATIMWindow,
   CapabilityInformation,
   BSSBasicRateSet,
   OperationalRateSet,
   Country,
   IBSSDFSRecoveryInterval,
   Load,
   TPCTransmitPower,
   TPCLinkMargin,
   NeighbourBSSSet,
   ListOfAvailableChannels,
   NetworkChannels,
   AntennaInfo,
   TVBDInfo,
   SysEntityID,
   TVBDID,
   ListOfNeighbours,
   …
}

COEX_I_PARAM_IDs ::= SEQUENCE OF I_PARAM_ID

I_PARAM_VALUE ::= CHOICE{
   BSSID                              STRING,
   SSID                               STRING,
   BSSType                            ENUMERATED,
   BeaconPeriod                       INTEGER,
   DTIMPeriod                         INTEGER,
   Timestamp                          INTEGER,
   LocalTime                          INTEGER,
   PHYParameterSet                    PHY_PARAM_SET,
   CFParameterSet                     CF_PARAM_SET,
```

```
   IBSSATIMWindow                  TU,
   CapabilityInformation           BSS_CAPA_INFO,
   BSSBasicRateSet                 SET OF INTEGER,
   OperationalRateSet              SET OF INTEGER,
   Country                         STRING,
   IBSSDFSRecoveryInterval         INTEGER,
   Load                            BSS_LOAD,
   TPCTransmitPower                INTEGER,
   TPCLinkMargin                   INTEGER,
   NeighbourBSSSet                 NEIBR_BSS_SET,
   ListOfAvailableChannels         LIST_TV_CHANNELS,
   NetworkChannels                 NETWORK_CHANNELS,
   AntennaInfo                     ANTENNA_INFO,
   TVBDInfo                        TVBD_INFO,
   SysEntityID                     INTEGER,
   TVBDID                          STRING,
   ListOfNeighbours                LIST_NEIGHBOURS,
   …
}

COEX_I_PARAM ::= SEQUENCE{
   InfoParamId          I_PARAM_ID,
   InfoStatus           I_STATUS,
   InfoParamValue       I_PARAM_VALUE
}

COEX_I_PARAMs ::= SEQUENCE OF COEX_I_PARAM

I_STATUS ::= ENUMERATED{
   SUCCESS,
   NOT_AVAILABLE_NOW,
   NOTSUPPORTED,
   BUSY,
   …
}

SYS_ENTITY_ID ::= INTEGER

INFO_DEST ::= SEQUENCE OF SYS_ENTITY_ID
```

Table 3 describes parameters of data types of information service of Coexistence Media SAP.

Table 3 – Parameters of data types of information service of Coexistence Media SAP

Name	Type	Valid range	Description	Note
BSSID	MAC_ADDR	N/A	The BSSID of the found BSS.	802.11-2007 Scan. confirm BSS Description Set
SSID	OCTET_STRING	1..32 octets	The SSID of the found BSS.	
BSSType	ENUMERATED	INFRASTRUCTURE, INDEPENDENT	The type of the found BSS.	
BeaconPeriod	INTEGER	N/A	The Beacon period of the	

			found BSS (in TU).	
DTIMPeriod	INTEGER	As defined in frame format	The DTIM period of the BSS (in beacon periods).	
Timestamp	INTEGER	N/A	The timestamp of the received frame (probe response/beacon) from the found BSS.	
LocalTime	INTEGER	N/A	The value of the STA fs TSF timer at the start of reception of the first octet of the timestamp field of the received frame (probe response or beacon) from the found BSS.	
PHYParameter Set	PHY_PARAM_ SET	As defined in frame format or according to the relevant PHY clause	The parameter sets relevant to the PHY from the received Beacon or Probe Response frame. If no PHY Parameter Set information element is present in the received frame, this parameter contains the channel number on which the frame was received. Valid channel numbers are defined in the relevant PHY clause.	
CFParameter Set	CF_PARAM_ SET	As defined in frame format	The parameter set for the CF periods, if found BSS supports CF mode.	
IBSSATIM Window	TU	As defined in frame format	The parameter set for the IBSS, if found BSS is an IBSS.	
Capability Information	BSS_CAPA_ INFO	As defined in frame format	The advertised capabilities of the BSS.	
BSSBasicRate Set	SET OF INTEGER	1..127 inclusive (for each integer in the set)	The set of data rates that must be sup-ported by all STAs that desire to join this BSS. The STAs must be able to receive and transmit at each of the data rates listed in the set.	
Operational RateSet	SET OF INTEGER	1..127 inclusive (for each integer in the set)	The set of data rates that the STA desires to use for communication within the BSS. The STA must be able to receive at each of the data rates listed in the set. This set is a superset of the rates contained in the BSSBasicRateSet parameter.	
Country	STRING	As defined in the Country element	The information required to identify the regulatory	

			domain in which the STA is located and to configure its PHY for operation in that regulatory domain. Present only when TPC functionality is required, as specified in 11.8, or when dot11MultiDomain CapabilityEnabled is true.	
IBSSDFS Recovery Interval	INTEGER	1..255	Only present if BSSType = INDEPENDENT. The time interval that is used for DFS recovery. Present only when DFS functionality is required.	
Load	BSS_LOAD	As defined in frame format	The values from the BSS Load information element if such an element was present in the probe response or Beacon frame, else null.	
TPCTransmit Power	INTEGER		The Transmit Power field shall be set to the transmit power used to transmit the frame containing the TPC Report element. The field is coded as a signed integer in units of decibels relative to 1 mW. The maximum tolerance for the transmit power value reported in the TPC Response element shall be ± 5 dB. This tolerance is defined as the difference, in decibels, between the reported power value and the actual EIRP of the STA (measured when transmitting 1500 octet frames).	802.11-2007 TPC report MLME-TPCADAPT .confirm
TPCLink Margin	INTEGER		The Link Margin field contains the link margin at the time and for the rate at which the frame containing the TPC Request element was received. The field is coded as a signed integer in units of decibels. The LinkMargin field shall be set to 0 and shall be ignored when a TPC Report element is included in a Beacon frame or Probe Response frame.	

			The measurement method of Link Margin is beyond the scope of this standard.	
Neighbour BSSSet	NEIBR_BSS_ SET	Specified in the regulatory domain	Report the neighbor of an BSS Repot the channel of the neighbor BSS	11k Neighbour report
ListOfAvailable Channels	LIST_TV_ CHANNELS			802.11af 802.22
Network Channels	NETWORK_ CHANNELS		The parameter reports the network channels that TV band devices and networks are operating on.	802.11af IEEE 802.22 M-WRAN-SERVICE-REPORT
AntennaInfo	ANTENNA_ INFO		Specifying the antenna information of TV band devices.	IEEE 1900.6
TVBDInfo	TVBD_INFO		The value identifies the type of device at the geolocation registering	IEEE 802.22 IEEE 802.11 device types are denoted as WLAN STA and WLAN AP
NeighbourBSS Set	NEIBR_BSS_ SET	Specified in the regulatory domain	Report the neighbor of an BSS. Repot the channel of the neighbor BSS.	802.11k Neighbour report
SysEntityID	INTEGER		Logical ID of IEEE 802.19.1 system entity.	Parameters added for TVBD
TVBDID	STRING		This TVBDID can be the FCC ID	
ListOfAvailable Channels	LIST_TV_CHAN NELS		This parameter gives the list of availe channels (TV channels) as decided by the IEEE 802.19.1 system.	From IEEE 802.19.1 system to TVBDs
ListOf Neighbours	LIST_ NEIGHBOURS		This parameters gives the TVBD ID, TVBDInfo, occupied channels, mobility (fixed, moible),	

5.3.1.2 Reconfiguration service data types

The following data types are defined for reconfiguration service of Coexistence Media SAP.

```
COEX_R_OBJ_ID ::= ENUMERATED{
   ChannelSwitch,
   ChangeTransmitPower,
   Scheduling
```

```
}

R_PROFILE_PARAM_ID ::= ENUMERATED{
   NewRegulatoryClass,
   ChannelNumber,
   ChannelSwitchMode,
   ChannelSwitchCount,
   DSELocalPowerConstraint,
   NewNetworkChannels,
   DisallowedChannels,
   OperatingChannels,
   Scheduling
   …
}

R_PROFILE_PARAM _VALUE ::= CHOICE{
   NewRegulatoryClass               INTEGER,
   ChannelNumber,                   INTEGER,
   ChannelSwitchMode                CHANNEL_SWITCH_MODE,
   ChannelSwitchCount               INTEGER,
   DSELocalPowerConstraint          INTEGER,
   NewNetworkChannels               NET_CHANNELs,
   DisallowedChannels               SET OF INTEGER,
   OperatingChannels                SET OF INTEGER,
   Schedule                         SCHEDULE,
   …
}

R_PROFILE_PARAM ::= SEQUENCE{
   ReconProfileParamID              R_PROFILE_PARAM_ID,
   ReconProfileParamValue           R_PROFILE_PARAM_VALUE
}

COEX_R_PROFILE ::= SEQUENCE OF R_PROFILE_PARAM

COEX_R_PARAM ::= SEQUENCE{
   CoexReconObjID                   COEX_R_OBJ_ID,
   CoexReconProfile                 COEX_R_PROFILE
}

COEX_R_PARAMs ::= SEQUENCE OF COEX_R_PARAM

R_STATUS ::= ENUMERATED{
   SUCCESS,
   NOTSUPPORTED,
   BUSY,
   TOANOTHERVALUE,
   …
}

COEX_R_RESULT ::= SEQUENCE{
   CoexReconObjID       COEX_R_OBJ_ID,
   ReconStatus          R_STATUS,
   CoexReconParams      COEX_R_PARAMs          OPTIONAL
}

COEX_R_RESULTs ::= SEQUENCE of COEX_R_RESULT
```

Table 4 and Table 5 describe parameters of data types of reconfiguration service of Coexistence Media SAP.

Table 4 – Parameters of data types of reconfiguration service of Coexistence Media SAP

Name	Type	Valid range	Description	Note
NewRegulatory Class	INTEGER		The New Regulatory Class field is set to the number of the regulatory class after the channel switch, as defined in Annex J in IEEE 802.11 standards	802.11-2007 Channel Switch 802.11y Extended Channel Switch
NewChannel Number	INTEGER	As specified in the regulatory domain	The number of the new channel to be switched to.	
ChannelSwitch Mode	CHANNEL_ SWITCH_MODE	0 or 1	A Channel Switch Mode set to 1 means that the STA in a BSS to which the frame containing the element is addressed shall transmit no further frames within the BSS until the scheduled channel switch. A STA in an IBSS may treat a Channel Switch Mode field set to 1 as advisory. A Channel Switch Mode set to 0 does not impose any requirement on the receiving STA.	
ChannelSwitch Count	INTEGER	Specifies the number of TBTTs until the channel switch event, as described for the Channel Switch Announcement element.	The Channel Switch Count field either shall be set to the number of TBTTs until the STA sending the Channel Switch Announcement element switches to the new channel or shall be set to 0. A value of 1 indicates that the switch shall occur immediately before the next TBTT. A value of 0 indicates that the switch shall occur at any time after the frame containing the element is transmitted.	
DSELocal Power	INTEGER	Maximum 4w	The local maximum transmit power for a	802.11y

Constraint			channel is thus defined as the maximum transmit power level specified for the channel in the Country element minus the local power constraint specified for the channel in the DSE Power Constraint frame.	802.11af
NewNetwork Channels	NET_ CHANNELS		Specifies the network channels and maximum transmit power in a regulation domain that the TVBD are allowed to operate in TV band. The parameter has been defined in subclause 5.2.1.2 but is used for reconfiguration purpose. The parameter is used here to indicate the network channels that the TVBD should change to.	802.11af
Disallowed Channels	SET OF INTEGER		The parameter is used for disallowing a number of channels among the list of available channels from the TVWS database.	IEEE 802.22
Operating Channels	SET OF INTEGER		The parameter is used to select chanels for operation from the list of available channels	IEEE 802.22

Table 5 – Parameters of data types of reconfiguration service of Coexistence Media SAP

Name	Type	Valid range	Description	Note
BSSType	BSS_TYPE	INFRASTRUC TURE, INDEPENDENT, ANY_BSS	Determines whether infrastructure BSS, IBSS, or both, are included in the scan.	802.11-2007 Scan.request
BSSID	STRING	Any valid individual orbroadcast MAC address	Identifies a specific or wildcard BSSID.	
SSID	STRING	0..32 octets	Specifies the desired SSID or the wildcard SSID.	
ScanType	ENUMERATED	ACTIVE, PASSIVE	Indicates either active or passive scanning.	
ProbeDelay	INTEGER	N/A	Delay (in microseconds) to be used prior to transmitting a Probe frame during active scanning.	
ChannelList	SEQUENCE OF INTEGER	Each channel will be selected from the valid channel	Specifies a list of channels that are examined when scanning for a BSS.	

		range for the appropriate PHY and carrier set.		
MinChannel Time	INTEGER	ProbeDelay	The minimum time (in TU) to spend on each channel when scanning.	
MaxChannel Time	INTEGER	MinChannelTime	The maximum time (in TU) to spend on eachchannel when scanning.	
ChMeasuType	Ch_MEASU_ TYPE	0,1,2	0: Basic request; 1: Clear channel assessment (CCA) request 2: Receive power indication (RPI) histogram request	.11-2007 measure ment request
Channel Number	INTEGER	Specified in regulatory domain	Channel number for which the measurement request applies	
StartTime	INTEGER		The parameter specifies the time at which the requested measurement, as specified by the MeasurementType parameter, shall start. A value of 0 shall indicate it shall start immediately.	
Duratioin	INTEGER		The Measurement Duration field shall be set to the duration of the requested measurement, as specified by the MeasurementType parameter, expressed in TUs.	
LinkMeasu PeerAdd	STRING	Any valid individual MAC address	The address of the peer MAC entity to which the Link Measure Request shall be sent.	802.11k Link measure ment
LinkMeasu TxPower	INTEGER		The transmit power to be used when transmitting the Link Measurement Request frame and included in the frame body	
LinkMeasu MaxiTxPower	INTEGER		The maximum transmit power to be used by the transmitting STA on its operating channel.	
Sensing Window	SENSING_ WINDOW		Specification consists of: NumSensingPeriods SensingPeriodDuration SensingPeriodInterval	802.22 SM-SSF
SignalType	SIGNAL_TYPE		The interger number specifies the following	

			types of signals to be sensed by the spectrum sensor. 0: Any Signal Type 1: IEEE 802.22 WRAN 2: ATSC 3: DVB-T 4: ISDB-T 5: NTSC 6: PAL 7: SECAM 8: Wireless Microphone 9: IEEE 802.22.1 Sync Burst 10: IEEE 802.22.1 PPDU MFS1 11: DVB-TIEEE 802.22.1 PPDU MSF2 12: IEEE 802.22.1 PPDU MSF3 13: Medical telemetry devices 14: Studio-transmitter link 15-24 Reserved	
SensingMode	SENSING_ MODE		Mode 0: For each signal type the SSF generates a binary decision as to whether the signal is present in the television channel Mode 1: Same as sensing mode 0 with the addition of a confidence metric for binary decision Mode 2: For each signal type the spectrum sensor generates an estimate of the field strength of that Signal Mode 3: Same as sensing mode 2 with the standard deviation of the field strength estimate from sensing mode 2. Mode4: reserved	
Detection Threshold	REAL	-160~70	The parameter specifies the noise power in dBm.	IEEE 1900.6
Performance Metric	PERF_METRIC		Parameter that indicates the quality of sensing.	
Geolocation	STRING		Reques to obtain the geolocation information of the TV band devices.	IEEE 802.22 GL-SAP, 802.11af, 1900.6

1

5.3.1.3 Measurement service data types

The following data types are defined for measurement service of Coexistence Media SAP.

```
COEX_M_OBJ_ID ::= ENUMERATED{
   802.11BSSScan,
   802.11ChannelMeasu,
   802.11kLinkMeasu,
   802.22Sensing
}

M_PROFILE_PARAM_ID ::= ENUMERATED{
   BSSType,
   BSSID,
   SSID,
   ScanTYpe,
   ProbeDelay,
   ChannelList,
   MinChannelTime,
   MaxChannelTIme,
   ChMeasuType,
   ChannelNumber,
   StartTime,
   Duration,
   LinkMeasuPeerAdd,
   LinkMeasuTxPower,
   LinkMesuMaxiTxPower,
   SensingWindow,
   SignalType,
   SensingMode,
   DetectionThreshold,
   PerformanceMetric,
   Geolocation,
   …
}

M_PROFILE_PARAM_VALUE ::= CHOICE{
   BSSType                          BSS_TYPE,
   BSSID                            STRING,
   SSID                             STRING,
   ScanType                         SCAN_TYPE,
   ProbeDelay                       INTEGER,
   ChannelList                      SEQUENCE OF INTEGER,
   MinChannelTIme                   INTEGER,
   MaxChannelTime                   INTEGER,
   ChMeasuType                      CH_MEASU_TYPE,
   ChannelNumber                    INTEGER,
   StartTime                        INTEGER,
   Duration                         INTEGER,
   LinkMeasuPeerAdd                 STRING,
   LinkMeasuTxPower                 INTEGER,
   LinkMeasuMaxiTxPower             INTEGER,
   SensingWindow                    SENSING_WINDOW,
   SignalType                       SIGNAL_TYPE,
```

```
   SensingMode                         SENSING_MODE,
   DetectionThreshold                  REAL,
   PerformanceMetric                   PERF_METRIC,
   Geolocation                         STRING,
   …
}

M_PROFILE_PARAM ::= SEQUENCE{
   MeasuProfileParamID                 M_PROFILE_PARAM_ID,
   MeasuProfileParamValue              M_PROFILE_PARAM_VALUE
}

COEX_M_PROFILE ::= SEQUENCE OF M_PROFILE_PARAM

COEX_M_PARAM ::= SEQUENCE{
   CoexMeasuObjID                      COEX_M_OBJ_ID,
   CoexMeasuProfile                    COEX_M_PROFILE
}

COEX_M_PARAMs ::= SEQUENCE OF COEX_M_PARAM

M_STATUS ::= ENUMERATED{
   SUCCESS,
   NOTSUPPORTED,
   BUSY,
   …
}

M_RESULT_PARAM_ID ::= ENUMERATED{
   BSSID,
   SSID,
   BSSType,
   BeaconPeriod,
   DIMPeriod,
   TimeStamp,
   LocalTime,
   PHYParameterSet,
   CFParameterSet,
   IBSSATIMWindow,
   CapabilityInformation,
   BSSBasicRateSet,
   OperationalRateSet,
   Country,
   IBSSDFSRecoveryInterval,
   Load,
   ChMeasuType,
   ChannelNumber,
   StartTime,
   Duration,
   ChMeasuReport,
   TransmitPower,
   LinkMagin,
   RCPI,
   RSNI,
   ReceiveAntennaID,
   TransmitAntennaID,
   SensingResult,
```

```
   Geolocation,
   …
}

M_RESULT_PARAM_VALUE ::= CHOICE{
   BSSID                              STRING,
   SSID                               STRING,
   BSST                               BSS_TYPE,
   BeaconPeriod                       INTEGER,
   DIMPeriod                          INTEGER,
   TimeStamp                          INTEGER,
   LocalTime                          INTEGER,
   PHYParameterSet                    PHY_PARAM_SET,
   CFParameterSet                     CF_PARAM_SET,
   IBSSATIMWindow                     TU,
   CapabilityInformation              BSS_CAPA_INFO,
   BSSBasicRateSet                    SET OF INTEGER,
   OperationalRateSet                 SET OF INTEGER,
   Country                            STRING,
   IBSSDFSRecoveryInterval            INTEGER,
   Load                               BSS_LOAD,
   ChMeasuType                        CH_MEASU_TYPE,
   ChannelNumber                      INTEGER,
   StartTime                          INTEGER,
   Duration                           INTEGER,
   ChMeasuReport                      CH_MEASU_REPORT,
   TransmitPower                      INTEGER,
   LinkMargin                         INTEGER,
   RCPI                               REAL,
   RSNI                               REAL,
   ReceiveAntennaID                   INTEGER,
   TransmitAntennaID                  INTEGER,
   SensingResult                      SENSING_RESULT,
   Geolocation                        STRING,
   …
}

M_RESULT_PARAM ::= SEQUENCE{
   MeasuResultParamID                 M_RESULT_PARAM_ID,
   MeasuResultParamValue              M_RESULT_PARAM_VALUE
}

M_RESULT_PARAMs ::= SEQUENCE OF M_RESULT_PARAM

COEX_M_RESULT ::= SEQUENCE{
   CoexMeasuObjID                     COEX_M_OBJ_ID,
   MeasuStatus                        M_STATUS,
   MeasuResultParams                  M_RESULT_PARAMs
}

COEX_M_RESULTs ::= SEQUENCE of COEX_M_RESULT
```

Table 6 describes parameters of data types of measurement service of Coexistence Media SAP.

Table 6 – Parameters of data types of measurement service of Coexistence Media SAP

Name	Type	Valid range	Description	Note
BSSID	STRING	N/A	The BSSID of the found BSS.	802.11-2007 Scan. confirm BSS Description Set
SSID	STRING	1..32 octets	The SSID of the found BSS.	
BSSType	BSS_TYPE	INFRASTRUCTURE, INDEPENDENT	The type of the found BSS.	
BeaconPeriod	INTEGER	N/A	The Beacon period of the found BSS (in TU).	
DTIM Period	INTEGER	As defined in frame format	The DTIM period of the BSS (in beacon periods).	
Timestamp	INTEGER	N/A	The timestamp of the received frame (probe response/beacon) from the found BSS.	
LocalTime	INTEGER	N/A	The value of the STA fs TSF timer at the start of reception of the first octet of the timestamp field of the received frame (probe response or beacon) from the found BSS.	
PHYParameter Set	PHY_PARAM_SET	As defined in frame format or according to the relevant PHY clause.	The parameter sets relevant to the PHY from the received Beacon or Probe Response frame. If no PHY Parameter Set information element is present in the received frame, this parameter contains the channel number on which the frame was received. Valid channel numbers are defined in the relevant PHY clause.	
CFParameter Set	CF_PARAM_SET	As defined in frame format	The parameter set for the CF periods, if found BSS supports CF mode.	
IBSSATIM Window	TU	As defined in frame format	The parameter set for the IBSS, if found BSS is an IBSS.	
Capability Information	BSS_APA_INFO	As defined in frame format	The advertised capabilities of the BSS.	
BSSBasicRate Set	SET OF INTEGER	1..127 inclusive (for each integer in the set)	The set of data rates that must be sup-ported by all STAs that desire to join this BSS. The STAs must be able to receive and transmit at each of the data rates listed in the set.	
Operational	SET OF	1..127 inclusive	The set of data rates that	

RateSet	INTEGER	(for each integer in the set)	the STA desires to use for communication within the BSS. The STA must be able to receive at each of the data rates listed in the set. This set is a superset of the rates contained in the BSSBasicRateSet parameter.	
Country	STRING	As defined in the Country element	The information required to identify the regulatory domain in which the STA is located and to configure its PHY for operation in that regulatory domain. Present only when TPC functionality is required, as specified in 11.8, or when dot11MultiDomainCapabilityEnabled is true.	
IBSSDFS Recovery Interval	INTEGER	1..255	Only present if BSSType = INDEPENDENT. The time interval that is used for DFS recovery. Present only when DFS functionality is required.	
Load	BSS_LOAD	As defined in frame format	The values from the BSS Load information element if such an element was present in the probe response or Beacon frame, else null.	
Measurement Type	CH_MEASU_ TYPE	0,1,2	0: Basic request; 1: Clear channel assessment (CCA) request 2: Receive power indication (RPI) histogram request	.11-2007 measure ment report
Channel Number	INTEGER	Specified in regulatory domain	channel number for which the measurement report applies	
StartTime	INTEGER		The parameter specifies the time at which the requested measurement, as specified by the MeasurementType parameter, has started. A value of 0 shall indicate it shall start immediately.	
Duratioin	INTEGER		The Measurement Duration field shall be set to the duration of the requested measurement, as specified by the MeasurementType	

			parameter, expressed in TUs.	
ChMeasu Report	CH_MEASU_ REPORT		Result of selected measurement. See the following tables for the parameter description of BasicReport, CCAReport and RPIhistogramReport	
TransmitPower	INTEGER	As defined in the TPC Report element	The contents of the Transmit Power field of the received Link Measurement Report frame. Present only(#1472) if ResultCode = SUCCESS.	802.11k Link measure ment
LinkMargin	INTEGER	As defined in the TPC Report element	The contents of the Link Margin field of the received Link Measurement Report frame. Present only(#1472) if Result-Code = SUCCESS.	
RCPI	REAL	As defined in 15.4.8.5 (Received Channel Power Indicator Measurement(11k)), or 17.3.10.6 (Received Chan-nel Power Indicator Measure-ment(11k)), or 18.4.8.5 (Received Channel Power Indicator Measurement(11k))	The RCPI level of the corresponding Link Measurement Request frame received at the reporting STA. Present only(#1472) if ResultCode = SUCCESS.	
RSNI	REAL	As defined in 7.3.2.41 (RSNI element(11k))	The RSNI of the corresponding Link Measurement Request frame received at the reporting STA. Present only(#1472) if ResultCode = SUCCESS	
Receive AntennaID	INTEGER	0~255	The Antenna ID corresponding to the antenna on which the Link Measurement Request frame was received at the report-ing STA. Antenna ID is defined in 7.3.2.29 (EDCA Parameter Set element).	

Transmit AntennaID	INTEGER	0~255	The Antenna ID corresponding to the antenna used to transmit the Link Mea-surement Report frame. Antenna ID is defined in 7.3.2.29 (EDCA Parameter Set element).	
SensingResult	SENSING_ RESULT		Return the result of spectrum measurement for the selected sensing mode.	
Geolocation	String		Result of geolocation measurement	IEEE 802.22 GL-SAP, 802.11af and 1900.6

5.3.1.4 Event service data types

The following data types are defined for event service of Coexistence Media SAP.

```
COEX_E_ID ::= ENUMERATED{
   NewBSSStart,
   Interference,
   NewChannelAdded,
   ChannelRemoved,
   NeighbourChange,
   InformationForSharing,
   NetworkChannelChanged,
   …
}

E_PARAM_ID ::= ENUMERATED{
   BSSID,
   NeighbourChange,
   InterferenceLevels,
   AddedChannelList,
   RemovedChannelList,
   UpdatedNetworkChannels
   …
}

E_PARAM_VALUE ::= CHOICE {
   BSSID                          STRING,
   NeighbourChange                NEIGHBOUR_CHANGE,
   InterferenceLevels             INTERFERENCE_LEVELs,
   AddedChannelList               LIST_TV_CHANNELS,
   RemovedChannelList             LIST_TV_CHANNELS,
   UpdatedNetworkChannels         NETWORK_CHANNELS,
   …
}

E_PARAM ::= SEQUENCE{
```

```
   EventParamID                    E_PARAM_ID
   EventParamValue                 E_PARAM_VALUE
}

E_PARAMs ::= SEQUENCE OF E_PARAM

COEX_E_PARAM ::= SEQUENCE{
   CoexEventId          COEX_E_ID
   CoexEvenParams       E_PARAMs
}

COEX_E_PARAMs ::= SEQUENCE OF COEX_E_PARAM
```

Table 7 describes parameters of data types of event service of Coexistence Media SAP.

Table 7 – Parameters of data types of event service of Coexistence Media SAP

Name	Type	Valid range	Description	Note
BSSID	STRING	Any valid individual or broadcast MAC address	Identifies a specific or wildcard BSSID that just started.	11-2007 Start(a new BSS)
Neighbour Change	NEIGHBOUR_ CHANGE		A set of BSSID that	802.11-2007
InterfereLevels	INTERFERENCE _LEVELs			802.19.1 specific
AddedChannel List	LIST_TV_ CHANNELS	Specified in regulatory domain	This parameter indicates the changes on the available channels by specifiying a list of channel numbers that become available.	802.19.1 specific
Removed ChannelList	LIST_TV_ CHANNELS	Specified in regulatory domain	This parameter indicates the changes on the available channels by specifiying a list of channel numbers that are no more available.	802.19.1 specific
Neighbour Change	NEIGHBOUR_ CHANGE		A set of BSSID that	802.19.1
Updated Network Channels	NET_ CHANNELS		Indicates the changes of network channels	802.19.1

5.3.1.5 Common data types

The following common data types are defined. They are used in the data type definitions of several services of Coexistence Media SAP.

```
TU ::= INTEGER

PHY_PARAM_SET ::= SET{
   aSlotTime                          INTEGER
   aSIFSTime                          INTEGER
   aCCATime                           INTEGER
   aPHY-RX-START-Delay                INTEGER
   aRxTxTurnaroundTime                INTEGER
   aTxPLCPDelay                       INTEGER
   aRxPLCPDelay                       INTEGER
   aRxTxSwitchTime                    INTEGER
   aTxRampOnTime                      INTEGER
   aTxRampOffTime                     INTEGER
   aTxRFDelay                         INTEGER
   aRxRFDelay                         INTEGER
   aAirPropagationTime                INTEGER
   aMACProcessingDelay                INTEGER
   aPreambleLength                    INTEGER
   aPLCPHeaderLength                  INTEGER
   aMPDUDurationFactor                INTEGER
   aMPDUMaxLength                     INTEGER
   aCWmin                             INTEGER
   aCWmax                             INTEGER
}

CF_PARAM_SET ::= SET{
   CfpCount             INTEGER
   CfpPeriod            INTEGER
   CfpMaxDur            TU
   CfpDurRem            TU
}

BSS_CAPA_INFO ::= SET{
   ESS                                BOOLEAN
   IBSS                               BOOLEAN
   CFPollable                         BOOLEAN
   CFPollRequest                      BOOLEAN
   Privacy                            BOOLEAN
   ShortPreamble                      BOOLEAN
   PBCC                               BOOLEAN
   ChannelAgility                     BOOLEAN
   SpectrumMgmt                       BOOLEAN
   QoS                                BOOLEAN
   ShortSlotTime                      BOOLEAN
   APSD                               BOOLEAN
   DSSSOFDM                           BOOLEAN
   DelayedBlockAck                    BOOLEAN
   ImmediateBlockAck                  BOOLEAN
}

BSS_LOAD ::= SET{
   STACount                           INTEGER
   CHUtilization                      INTEGER
   AvailableAddmissionCap             INTEGER
}

NEIBR_BSS ::= SEQUENCE{
```

```
   NeighbourBSSId                    BSSID,
   NeighbourBSSChannel               INTEGER
}

NEIBR_BSS_SET ::= SEQUENCE OF NEIBR_BSS

TV_CHANNEL_NUMBER ::= INTEGER

TV_CHANNEL_NUMBERS ::= SEQUENCE OF TV_CHANNEL_NUMBER

TV_POWER_LIMIT ::= INTEGER

TV_POWER_LIMITS ::= SEQUENCE OF TV_POWER_LIMIT

LIST_TV_CHANNELS ::= SEQUENCE{
   NumTVChannels                     INTEGER,
   TimeStamp                         TU,
   TVChannelNums                     TV_CHANNEL_NUMBERS,
   TVChannelPowerLimits              TV_POWER_LIMITS
}
```

Table 8 describes parameters of LIST_TV_CHANNELS data type.

Table 8 – Parameters of LIST_TV_CHANNELS data type

Name	Type	Valid range	Description	Note
NumberOfTV Channels	INTEGER	Dependens on counry	The number of available TV channels. The parameter also specifies the vector size of information element xxx.2 and xxx.3	802.11af whitespace map
TimeStamp	TU		It indicates the TSF timestamp when a STA accesses TV bands database to get the White Space Map information	
TVChannel Numbers	SEQUENCE OF INTEGER		Specifies the list of TV channels for a given regulatory domin	
TVChannel PowerLimits	SEQUENCE OF INTEGER		Specifies the power constraints of availbel TV channels	

```
NETWORK_CHANNEL ::= SEQUENCE{
   OperationClass                    INTEGER,
   NumberofNetworkChannels           INTEGER,
   NetworkChannelNumber              INTEGER,
   NetworkChPowerConstraint          REAL
}
```

Table 9 describes parameters of NETWORK_CHANNEL data type.

Table 9 – Parameters of NETWORK_CHANNEL data type

Name	Type	Valid range	Description	Note
NumberOf Network Channel	INTEGER		The number of available network channels for 802.11 devices. The parameter also specifies the vector size of information element xxx.1, xxx.2 and xxx.3	802.11af network channel enablement
OperationClass	INTEGER		It indicates the operation classes that the listed network channels apply.	
Network Channel Number	INTEGER		Specifies the list of network channels for a given regulatory domin	
NetworkCh Power Constraint	rREAL		Specifies the power constraints of availbel network channels	

```
NETWORK_CHANNELS ::= SEQUENCE OF NETWORK_CHANNEL

POLARIZATION ::= ENUMERATED{
   Linear,
   Elliptical,
   Circular,
   …
}

ANTENNA_GAIN ::= SEQUENCE{
   Country                          STRING,
   TVChannelNumber                  TV_CHANNEL_NUMBER,
   AntennaGain                      REAL
}

ANTENNA_GAINS ::= SEQUENCE OF ANTENNA_GAIN

ANTENNA_INFO ::= SEQUENCE{
   AntennaBandwidth                 REAL,
   AntennaBeamPointing              REAL,
   AntennaBeamwidth                 REAL,
   AntennaDirectivityGain           REAL,
   AntennaHeight                    REAL,
   AntennaPolarization              POLARIZATION,
   AntennaGains                     ANTENNA_GAINS
}
```

Table 10 describes parameters of ANTENNA_INFO data type.

Table 10 – Parameters of ANTENNA_INFO data type

Name	Type	Valid range	Description	Note
Antenna Bandwidth	REAL		Bandwidth of the antenna used at the TV band devices.	1900.6
AntennaBeam Pointing	REAL		The DataSeet.AntennaBeamPointing parameter specifies the beam pointing direction of the antenna used at the spectrum measurement module by giving the azimuthal angle with respect to North and elevation angle with respect to the horizon.	
Antenna Beamwidth	REAL		Beamwidth of the antenna used at the spectrum measurement module, normally specified as half-power horizontal and vertical beamwidth.	
Antenna DirectivityGain	REAL		Directivity gain in dBi of the antenna radiation pattern at the TV band devices.	
AntennaHeight	REAL		Height of the antenna in meters with respect to sea level. (cf. 6.3.32)	
Antenna Polarization	ENUMERATED		Polarization of the antenna used at the TV band devices. (cf. 6.3.32) 0: Linear polarization 1: Circular polarization 2: Elliptical polarization	
AntennaGain	ANTENNA_ GAINS		Power gain in dB of the antenna used at the TV band devices for a list of TV channels.	

```
TVBD_INFO ::= ENUMERATED{
   WRAN_BS,
   WRAN_CPE,
   WLANSTA,
   WLANAP,
   MAN_AP,
   MAN_STA
   …
}

NEIGHBOUR ::= SEQUENCE{
```

```
   TVBDID,                          STRING,
   TVBDInfo             TVBD_INFO,
   TVBDOccupiedChannels,            LIST_TV_CHANNELS,
   Mobility                         MOBILITY,
   …
}

LIST_NEIGHBOURS ::= SEQUENCE OF NEIGHBOUR

MOBILITY ::= ENUMERATED{
   FIXED,
   MOBILE,
   …
}

CHANNEL_SWITCH_MODE ::= ENUMERATED{
   TXRestricted,
   NOTRestricted
}

BSS_TYPE ::= ENUMERATED{
   INFRASTRUCTURE,
   INDEPENDENT,
   ANYBSS
}

SCAN_TYPE ::= ENUMERATED{
   ACTIVE,
   PASSIVE
}

CH_MEASU_TYPE ::= ENUMERATED{
   BASIC,
   CCA,
   RPI
}

SENSING_WINDOW ::= SEQUENCE{
   NumSensingPeriods                INTEGER,
   SensingPeriodDuration            INTEGER,
   SensingPeriodInterval            INTEGER
}
```

Table 11 describes parameters of SENSING_WINDOW data type.

Table 11 – Parameters of SENSING_WINDOW data type

Name	Type	Valid range	Description	Note
NumSensing Periods	INTEGER	0 to 63	The number of sensing periods	
SensingPeriod Duration	INTEGER	0 to 1023	Duration of each sensing in terms of the number symbols	802.22 SM-SSF

SensingPeriod Interval	INTEGER	0 to 2047	Duration of interval in terms of the number of frames.	

```
SIGNAL_TYPE ::= ENUMERATED{
   Any,
   802.22WRAN,
   ATSC,
   DVB_T,
   ISDB_T,
   NTSC,
   PAL,
   SECAM,
   Microphone,
   802.22.1SyncBurst,
   802.22.1PPDUMFS1,
   802.22.1PPDUMSF2,
   802.22.1PPDUMSF3,
   MedicalTele,
   Studio,
   …
}

SENSING_MODE ::= ENUMERATED{
   Hard,
   HardWithConfidenceValue,
   Soft,
   SoftWithConfidenceValue
}

PERF_METRIC ::= SEQUENCE{
   PerfMetricPd          INTEGER,
   PerfMetricPfa         INTEGER
}
```

Table 12 describes parameters of PERF_METRIC data type.

Table 12 – Parameters of PERF_METRIC data type

Name	Type	Valid range	Description	Note
PerfMetricPd	INTEGER			When the PerformanceMetric.pd is specified sensors perform sensing by setting the rate of detection according to this value. Rate of detection is expressed as a percentage bounded between 0% and 100%.
PerfMetricPfa	INTEGER			When the PerformanceMetric.pfa is specified sensors perform sensing by setting the rate of false alarm according this value. Rate of false alarm is expressed as a percentage

				bounded between 0% and 100%.

```
BASIC_REPORT ::= SEQUENCE{
   BSS                              BOOLEAN,
   OFDM                             BOOLEAN,
   UnidentifiedSignal               BOOLEAN,
   PrimaryServiceSignal             BOOLEAN,
   Unmeasured                       BOOLEAN,
   …
}
```

Table 13 describes parameters of BASIC_REPORT data type.

Table 13 – Parameters of BASIC_REPORT data type

Name	Type	Valid range	Description	Note
BSS	BOOLEAN		BSS bit, which shall be set to 1 when at least one valid MPDU was received in the channel during the measurement period from another BSS or IBSS. Otherwise, the BSS bit shall be set to 0.	
OFDM	BOOLEAN		OFDM preamble bit, which shall be set to 1 when at least one sequence of short training symbols, as defined in 17.3.3, was detected in the channel during the measurement period without a subsequent valid Signal field (see 17.3.4). This may indicate the presence of an OFDM preamble, such as highperformance RLAN/2 (HIPERLAN/2). Otherwise, the OFDM preamble bit shall be set to 0.	
Unidentified Signal	BOOLEAN		May be set to 1 when significant power is detected in the channel during the measurement period that cannot be characterized as radar, an OFDM preamble, or a valid	

			MPDU. Otherwise, the Unidentified Signal bit shall be set to 0. The definition of significant power is implementation dependent.	
PrimaryService Signal	BOOLEAN		Shall be set to 1 when primary service signals was detected operating in the channel during the measurement period. The algorithm to detect radar shall satisfy regulatory requirements and is outside the scope of this standard. Otherwise, the Radar bit shall be set to 0.	
Unmeasured	BOOLEAN		Shall be set to 1 when this channel has not been measured. Otherwise, the Unmeasured bit shall be set to 0. When the Unmeasured field is set to 1, all the other bit fields shall be set to 0.	

```
CCA_REPORT ::= SEQUENCE{
   CCABusy              REAL,
   …
}
```

Table 14 describes parameters of CCA_REPORT data type.

Table 14 – Parameters of CCA_REPORT data type

Name	Type	Valid range	Description	Note
CCABusy	REAL	From 0 to 1	The CCA Busy Fraction field shall contain the fractional duration over which CCA indicated the channel was busy during the measurement duration. The resolution of the CCA busy measurement is in microseconds. The CCA Busy Fraction value is defined as Ceiling (255 * [Duration CCA indicated channel was busy	

			(microseconds)] / (1024 * [Measurement duration (TUs)])).	

```
RPI_REPORT ::= SEQUENCE{
   RPIHistogramReportRPI0Density0              INTEGER,
   RPIHistogramReportRPI0Density1              INTEGER,
   RPIHistogramReportRPI0Density2              INTEGER,
   RPIHistogramReportRPI0Density3              INTEGER,
   RPIHistogramReportRPI0Density4              INTEGER,
   RPIHistogramReportRPI0Density5              INTEGER,
   RPIHistogramReportRPI0Density6              INTEGER,
   RPIHistogramReportRPI0Density7              INTEGER
}
```

Table 15 describes parameters of RPI_REPORT data type.

Table 15 – Parameters of RPI_REPORT data type

Name	Type	Valid range	Description	Note
RPIHistogram ReportRPI0 Density0	INTEGER	0~255	Density for Power ≤ –87	
RPIHistogram ReportRPI0 Density1	INTEGER	0~255	Density for –87 < Power ≤–82	
RPIHistogram ReportRPI0 Density2	INTEGER	0~255	Density for –82 < Power ≤–77	
RPIHistogram ReportRPI0 Density3	INTEGER	0~255	Density for –77 < Power ≤–72	
RPIHistogram ReportRPI0 Density4	INTEGER	0~255	Density for –72 < Power ≤–67	
RPIHistogram ReportRPI0 Density5	INTEGER	0~255	Density for –67 < Power ≤–62	
RPIHistogram ReportRPI0 Density6	INTEGER	0~255	Density for –62 < Power ≤–57	
RPIHistogram ReportRPI0 Density7	INTEGER	0~255	Density for –57 < Power	

```
CH_MEASU_REPORT ::= CHOICE{
   BasicReport          BASIC_REPORT,
   CCAReport            CCA_REPORT,
   RPIHistogramReport   RPI_REPORT
}
```

```
INTERVAL ::= SEQUENCE{
   IntervalStart        REAL,
   IntervalStop         REAL
}

CONFIDENCE_LEVEL ::= SEQUENCE{
   ConfidenceLevelValue             REAL,
   ConfidenceLevelInterval          INTERVAL
}

MODE0RESULT ::= SEQUENCE{
   SignalType           SIGNAL_TYPE,
   Presence             BOOLEAN
}

MODE0RESULTs ::= SEQUENCE OF MODE0RESULT
```

Table 16 describes parameters of MODE0RESULT data type.

Table 16 – Parameters of MODE0RESULT data type

Name	Type	Valid range	Description	Note
SignalType	SIGNAL_TYPE			
Presence	BOOLEAN	0 or 1	For each signal type the SSF generates a binary decision as to whether the signal is present in the television channel	IEEE 802.22

```
MODE1RESULT ::= SEQUENCE{
   Mode0Result          MODE0RESULT,
   ConfidenceLevel      CONFIDENCE_LEVEL
}

MODE1RESULTS ::= SEQUENCE OF MODE1RESULT
```

Table 17 describes parameters of MODE1RESULT data type.

Table 17 – Parameters of MODE1RESULT data type

Name	Type	Valid range	Description	Note
SignalType	SIGNAL_TYPE			
SignalPresence	BOOLEAN		For each signal type the SSF generates a binary decision as to whether the signal is present in the television channel	IEEE 802.22

Confidence Level	CONFIDENCE_ LEVEL		Confidence of measurement result for each type of signal specified	IEEE 1900.6

```
MODE2RESULT ::= SEQUENCE{
   SignalType           SIGNAL_TYPE,
   Strength             REAL
}

MODE2RESULTS ::= SEQUENCE OF MODE2RESULT
```

Table 18 describes parameters of MODE2RESULT data type.

Table 18 – Parameters of MODE2RESULT data type

Name	Type	Valid range	Description	Note
SignalType	SIGNAL_TYPE			
Strength	REAL		For each signal type the SSF generates an estimate of the field strength of that signal	IEEE 802.22

```
MODE3RESULT ::= SEQUENCE{
   Mode2Result          MODE2RESULT,
   StandardDeviation    REAL
}

MODE3RESULTS ::= SEQUENCE OF MODE3RESULT
```

Table 19 describes parameters of MODE3RESULT data type.

Table 19 – Parameters of MODE3RESULT data type

Name	Type	Valid range	Description	Note
SignalType	SIGNAL_TYPE			
Strength	REAL		For each signal type the SSF generates an estimate of the field strength of that signal	IEEE 802.22
Standard Deviatoin	REAL		The standard deviation of the field strength estimate from sensing mode	IEEE 802.22

```
SENSING_RESULT ::= CHOICE{
```

```
   Mode0Results          MODE0RESULTs,
   Mode1Results          MODE1RESULTs,
   Mode2Results          MODE2RESULTs,
   Mode3Results          MODE3RESULTs
}

TRANSMISSIONINTERVAL ::= SEQUENCE{
   TransmissionStart                TU,
   TransmissionDuration             TU,
   TransmissionChannel              Network_CHANNEL
}

TRANSMISSIONSEQUENCE ::= SEQUENCE OF TRANSMISSIONINTERVAL

SCHEDULE ::= SEQUENCE{
   SchedulingStartTime              TU,
   SchedulingPeriodDuration         TU,
   NumberOfSchedulingPeriods        INTEGER,
   TransmissionSequence             TRANSMISSIONSEQUENCE
}

INTERFERENCE_LEVEL ::= SEQUENCE{
   NetworkChannel                   NETWORK_CHANNEL,
   Interference                     REAL
}

INTERFERENCE_LEVELs ::= SEQUENCE OF INTERFERENCE_LEVEL

NEIGHBOUR_CHANGE ::= SEQUENCE{
   AddedBSSs            SEQUENCE OF STRING,
   RemovedBSSs          SEQUENCE OF STRING
}
```

5.3.2 Coexistence Transport SAP data types

The following data types are defined for Coexistence Transport SAP.

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

TRANSPORT_ADDR ::= OCTET_STRING
```

6. Procedures and protocols

6.1 Generic procedures for information exchange

6.2 Protocols

7. Coexistence mechanisms and algorithms