IEEE 802.19.1a  
Wireless Coexistence

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| --- | --- | --- | --- | --- |
| Text proposal on Annex A | | | | |
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Abstract

This document provides text proposal on Annex A.

Text in this submission is made by D0.2, 19-16/0016r1, 19-16/0020r1, 19-16/0022r1, 19-16/0051r1, 19-16/0053r1, 19-16/0055r1, 19-16/0058r0, 19-16/0060r2, 19-16/0083r0, 19-16/0084r0, 19-16/0086r0, 19-16/0088r0 with some changes in order to keep consistency among them.

And also this text affects to the proposed Annex B (19-16/0093r0) and Annex C (19-16/0094r0).

Each data format is based on the other text proposal on section 6 (19-16/0090r0).

# **(normative)** Data types for IEEE 802.19.1a

IEEE802191aDataType DEFINITIONS AUTOMATIC TAGS ::= BEGIN

**-----------------------------------------------------------**

**--Exported data types**

**-----------------------------------------------------------**

--Exported data types

EXPORTS

--Coexistence protocol entity ID

CxID,

--Status

Status,

--Cx Media status

CxMediaStatus,

--Coexistence service

CoexistenceService,

--Network technology

NetworkTechnology,

--Network type

NetworkType,

--Geolocation

Geolocation,

--Coverage area

CoverageArea,

--Installation parameters

InstallationParameters,

--Frequency range

FrequencyRange,

--List of available frequencies

ListOfAvailableFrequencies,

--List of operating frequencies

ListOfOperatingFrequencies,

--List of supported frequencies

ListOfSupportedFrequencies,

--Required resource

RequiredResource,

--Operation code for registration

OperationCode,

--Measurement capability

MeasurementCapability,

--CM registration

CMRegistration,

--CE registration

CERegistration,

--Coexistence report

CoexistenceReport,

--List of coexistence reports

ListOfCoexistenceReports,

--Mobility Information

MobilityInformation,

--Entity profile

EntityProfile,

--List of master CM candidates

ListOfMasterCMCandidates,

--List of neighbor CMs

ListOfNeighborCMs,

--Coordinates

Coordinates,

--Antenna Characteristics

AntennaCharacteristics,

--Type of frequency

TypeOfFrequency,

--GCO Descriptor

GCODescriptor,

--Receiver information

ReceiverInfo,

--Modulation type

ModulationType,

--Filter characteristics

FilterCharacteristics,

--Energy detection information

EnergyDetectionInfo,

SpecRequestModification;

**-----------------------------------------------------------**

**--Coexistence protocol entity**

**-----------------------------------------------------------**

--Coexistence protocol entity type

CxType ::= ENUMERATED {

--Coexistence enabler

ce,

--Coexistence manager

cm,

--Coexistence discovery and information server

cdis,

--Coordination Enabler

coe

}

--Coexistence protocol entity ID

CxID ::= SEQUENCE {

--Entity type

type CxType,

--Entity ID

id OCTET STRING

}

**-----------------------------------------------------------**

**--Status**

**-----------------------------------------------------------**

--Status (See details in 6.1.3)

Status ::= ENUMERATED {

--Successfully processed

noError,

--Rejected due to security reasons

rejected,

--Different primitive/message is expected

invalidEntityStatus,

--Invalid values of parameters

invalidArgument,

--The process error in the receiving entity

processFailure,

--Connection error

networkFailure

}

--Coexistence media status

CxMediaStatus ::= ENUMERATED {

noErrorAccepted,

noErrorRejected,

errorInvalidEntityStatus,

errorInvalidArgument,

errorProcessFailure,

errorNetworkFailure,

errorUnknown

}

**-----------------------------------------------------------**

**--Coexistence service**

**-----------------------------------------------------------**

--Coexistence service

CoexistenceService ::= ENUMERATED {

--Information service

information,

--Management service

management,

--No service

noService

}

**-----------------------------------------------------------**

**--** List of accessible CMs

**-----------------------------------------------------------**

--List of accessible CMs

ListOfAccessibleCM ::= SEQUENCE OF SEQUENCE {

--CM ID

cmID CxID OPTIONAL,

--IP address

ipAddress OCTET STRING OPTIONAL,

--Port number

portNumber Integer OPTIONAL,

--Server password

serverPassword IA5String OPTIONAL,

...

}

**-----------------------------------------------------------**

**--Network technology**

**-----------------------------------------------------------**

NetworkTechnology ::= ENUMERATED {

--IEEE 802.11 technology except for .11af

ieee802dot11Technology,

--IEEE 802.11af

ieee802dot11af,

--IEEE 802.22

ieee802dot22,

--Radio microphone

radioMic,

--Area broadcast

areaBroadcast,

--ECMA 392

ecma392,

--3gpp Technology

technologyOf3gpp,

--MulteFire

multeFire,

...

}

**-----------------------------------------------------------**

**--Network type**

**-----------------------------------------------------------**

NetworkType ::= ENUMERATED {

--For TVBD complied with FCC C.F.R Part 15

fixed,

mode1,

mode2,

--For WSD complied with ETSI EN 301 598

typeA,

typeB,

--For CBSD complied with FCC C.F.R Part 96

categoryA,

categoryB,

...

}

**-----------------------------------------------------------**

**--Location**

**-----------------------------------------------------------**

--Location

Geolocation ::= CHOICE {

--Place name or ID

placeID OCTET STRING,

--Coordinates of GCO

coordinates Coordinates,

}

--Coordinates

Coordinates ::= SEQUENCE {

--Latitude [degree]

latitude REAL OPTIONAL,

--Longitude [degree]

longitude REAL OPTIONAL,

--Altitude [m]

altitude REAL OPTIONAL,

--Location uncertaingty

locationUncertainty REAL OPTIONAL

}

-----------------------------------------------------------------------------

--Region information

-----------------------------------------------------------------------------

--Information of the bounded area defined by the multiple geolocations

minNumGeolocInfo INTEGER ::= 3

Region ::= SEQUENCE{

numGeolocInfo INTEGER,

geolocation Geolocation(SIZE(minNumGeolocInfo..numGeolocInfo))

}

RectangularRegion ::= SEQUENCE{

--Geolocation of the upper-left point of the rectangular

geolocationUpper Geolocation,

--Geolocation of the lower-right point of the rectangular

geolocationLower Geolocation

}

--Range

Range ::= CHOICE {

--Information of the bounded area defined by the multiple geolocations

multipointRegion Region,

--Rectangular area defined by the upper-left and lower right points

rectangularRegion RectangularRegion

}

**-----------------------------------------------------------**

**--Installation parameters**

**-----------------------------------------------------------**

--Installation parameters

InstallationParameters ::= SEQUENCE {

--Geolocation of GCO

geolocation Geolocation OPTIONAL,

--Antenna characteristics

antennaCharacteristics AntennaCharacteristics OPTIONAL,

--Maximum transmission power [dBm]

maxTxPower REAL OPTIONAL,

--Adjacent channel leakage ratio of the GCO [dB]

aclr REAL OPTIONAL,

--Guaranteed QoS of backhaul connection of the GCO

guaranteedQoSOfBackhaulConnection GuaranteedQoSOfBackhaulConnection OPTIONAL,

--Receiver information

receiverInfo ReceiverInfo OPTIONAL,

--Modulation type

modulationType ModulationType OPTIONAL,

--Filter characteristics

filterCharacteristics FilterCharacteristics OPTIONAL,

--Management regional range of GCO

managementRange Range OPTIONAL,

...

}

--AntennaCharacteristics

AntennaCharacteristics ::= SEQUENCE {

--Antenna height [meter]

antennaHeight REAL OPTIONAL,

--Antenna height type

antennaHeightType HeightType OPTIONAL,

--Antenna gain [dB]

antennaGain REAL OPTIONAL,

--Antenna type

antennaType AntennaType OPTIONAL,

--Number of antenna

numberOfAntenna INTEGER OPTIONAL,

--MIMO type

mimoType MIMOType OPTIONAL,

-Multiple antenna processing capability

multiAntProCap MultiAntProCap OPTIONAL,

--Azimuth angle [deg]

azimuthAngle REAL OPTIONAL,

--Downtilt angle [deg]

downtiltAngle REAL OPTIONAL,

--beamwidth [deg]

beamwidth REAL OPTIONAL,

...

}

--Height type

HeightType ::= ENUMERATED {

--Above ground level

agl,

--Above sea level

asl

}

--Antenna type

AntennaType ::= ENUMERATED {

--Linear array

linear,

--Planar array

planar,

--Circular

circular,

...

}

--MIMO type

MIMOType ::= ENUMERATED {

--2D MIMO

twoDimentional,

--3D MIMO

threeDimentional

}

-- Multiple antenna processing capability

MultiAntProCap ::= ENUMERATED {

--Directional beam forming capability

beamforming,

--Multiple antenna precoding capability

precoding,

...

}

--Receiver information

ReceiverInfo ::= ENUMERATED {

--Successive interference canceller

sic,

--Zero-forcing

zeroForcing,

...

}

--Modulation Type

ModulationType ::= ENUMERATED {

--OFDM

ofdm,

--FBMC

fbmc,

...

}

--Modulation parameters

ModulationParameters ::= SEQUENCE OF CHOICE{

ofdm BOOLEAN,

--The overlapping K factor for FBMC

fbmcoverlappingFactor INTEGER,

...

}

--Filter Characteristics

FilterCharacteristics ::= SEQUENCE {

--Adjacent channel selectivity of the GCO [dB]

acs REAL OPTIONAL,

--FBMC overlapping factor range as the maximum number

fbmcOverlappingFactor INTEGER OPTIONAL,

...

}

--SIC demodulation procedure

SICDemodulationProcedure ::= ENUMERATED{

--demodulate desired signal directly

procedure1,

--demodulate interference then desired signal

procedure2,

...

}

SpecRequestModification ::= SEQUENCE {

--Spectrum request grouping information. GCOs with the same group index request spectrum together.

groupIndex REAL OPTIONAL,

--Spectrum that GCO shall check with the spectrum management database regarding to the availability.

spectrumCheck FrequencyRange OPTIONAL

}

--ListOfSpecUsageInfo

ListOfSpecUsageInfo ::= SEQUENCE OF SEQUENCE{

-- Geolocation information of GCO

listOfGeolocation SEQUENCE OF Geolocation

}

**-----------------------------------------------------------**

**--Guaranteed QoS of backhaul connection related data types**

**----------------------------------------------------------**

GuaranteedQoSOfBackhaulConnection ::= SEQUENCE{

--Backhaul type ID

backhaulTypeID BackhaulTypeID OPTIONAL,

--Guaranteed minimum bit rates of backhaul connection [Mb/s]

guaranteedMinimumBitRates REAL OPTIONAL,

--Guaranteed maximum latency [ms]

guaranteedMaximumLatency REAL OPTIONAL,

...

}

**-----------------------------------------------------------**

**--Backhaul type ID**

**-----------------------------------------------------------**

BackhaulTypeID ::= ENUMERATED{

xDSL,

opticalFibre,

...

}

**-----------------------------------------------------------**

**--Frequency range related data types**

**-----------------------------------------------------------**

--Frequency range

FrequencyRange ::= SEQUENCE {

--Start frequency [MHz]

startFreq REAL OPTIONAL,

--Stop frequency [MHz]

stopFreq REAL OPTIONAL

}

--List of available frequencies

ListOfAvailableFrequencies ::= SEQUENCE OF SEQUENCE {

--Timestamp

timestamp GeneralizedTime OPTIONAL,

--Frequency range

frequencyRange FrequencyRange OPTIONAL,

--Transmission power limit [dBm]

txPowerLimit REAL OPTIONAL,

--Start time when this frequency range is available

availableStartTime GeneralizedTime OPTIONAL,

-- Stop time when this frequency range is available

availableStopTime REAL OPTIONAL,

--Maximum total bandwidth [Hz]

maxTotalBandwidth REAL OPTIONAL,

--Maximum contiguous bandwidth [Hz]

maxContiguousBandwidth REAL OPTIONAL,

--Resolution bandwidth [Hz]

resolutionBandwidth REAL OPTIONAL,

--Type of available frequency

typeOfAvailablefrequency TypeOfFrequency OPTIONAL,

--Location validity [meter]

locationValidity REAL OPTIONAL,

--Aggregated interference control parameters

aggInterfCtrlParam AggregatedInterferenceControlParameters OPTIONAL,

...

}

-- Types of frequency

TypeOfFrequency ::= ENUMERATED {

--“Specific” as specified in ETSI EN 301 598

specific

--“Generic” as specified in ETSI EN 301 598

generic,

--Frequency for “Priority Access License (PAL)” as specified in FCC C.F.R Part 96

pal,

-- Frequency for “General Authorized Access (GAA)” as specified in FCC C.F.R Part 96

gaa,

...

}

--Aggregated interference control parameters

AggregatedInterferenceControlParameters ::= SEQUENCE{

--Reference point ID to be protected

referencePointID INTEGER OPTIONAL,

--Installation parameters of reference point

installationParameters InstallationParameters OPTIONAL,

--Adjacent channel leakage ratio of the GCO [dB]

aclr REAL OPTIONAL,

--Protection ratio of the reception to be protected[dB]

protectionRatio REAL OPTIONAL,

...

}

--List of supported frequencies

ListOfSupportedFrequencies ::= SEQUENCE OF SEQUENCE {

-- The frequency borders of each possible sub band or channel

frequencyRange FrequencyRange OPTIONAL,

-- Extra channel configuration is supported or not

extraChannelizationIsSupported BOOLEAN OPTIONAL,

-- Extra channel configuration description

extraChannelizationDescription ExtraChannelizationDescription OPTIONAL

}

--Extra channelization descriptions

ExtraChannelizationDescription ::= SEQUENCE{

--Maximum number of channel that GCO can simultaneously use.

maxNumberOfSimultaneousUse INTEGER OPTIONAL,

--List of supported bandwidth

listOfSupportedBandwidth SEQUENCE OF REAL OPTIONAL,

...

}

--List of operating frequencies and related operational parameters

ListOfOperatingFrequencies ::= SEQUENCE OF SEQUENCE {

--Frequency range

frequencyRange FrequencyRange OPTIONAL,

--Transmission power [dBm]

txPower REAL OPTIONAL,

--Resolution bandwidth [Hz]

resolutionBandwidth REAL OPTIONAL,

--Type of operating frequency

typeOfOperatingFrequency TypeOfFrequency OPTIONAL,

--Occupancy if known [fractional value between 0 and 1]

occupancy REAL OPTIONAL,

--Energy detection information

energyDetectionInfo EnergyDetectionInfo OPTIONAL,

--Modulation parameters

modulationParameters ModulationParameters OPTIONAL,

--Demodulation procedure

sicDemodulationProcedure SICDemodulationProcedure OPTIONAL,

--Interference leakage weighting factor

intLeakageFactor REAL OPTIONAL,

--List of reference point locations.

listOfSpecUsageInfoOfRefPoints ListOfSpecUsageInfo OPTIONAL,

--List of cochannel neighbor GCOs location

listOfSpecUsageInfoOfNeightborGCOs ListOfSpecUsageInfo OPTIONAL,

--Co-channel GCO limit

coChGCOLimit CoChGCOLimit OPTIONAL,

...

}

**-----------------------------------------------------------**

**--Required resource**

**-----------------------------------------------------------**

--Required resource

RequiredResource ::= SEQUENCE OF SEQUENCE {

--Required bandwidth

requiredBandwidth REAL OPTIONAL,

--Expected occupancy if known [fractional value between 0 and 1]

occupancy REAL OPTIONAL

}

**-----------------------------------------------------------**

**--** **List of desired performances**

**-----------------------------------------------------------**

ListOfDesiredPerformances ::= SEQUENCE OF SEQUENCE {

--Subject frequency range

frequencyRange FrequencyRange OPTIONAL,

--Desired energy detection successful rate in percentage [0 ~ 100]

desiredEnergyDectionSuccessRate REAL OPTIONAL,

--Percentage of activated cells of one operator [0 ~ 100]

desiredActivationRate REAL OPTIONAL,

...

}

**-----------------------------------------------------------**

**--Operation code for registration**

**-----------------------------------------------------------**

--Operation code for registration

OperationCode ::= ENUMERATED {

--New registration

new,

--Update of registration information

update,

--Deregistration

delete,

--Inform the spectrum usage release

release

}

**-----------------------------------------------------------**

**--Measurement capability**

**-----------------------------------------------------------**

MeasurementCapability ::= ENUMERATED {

energyDetection,

featureDetection,

...

}

**-----------------------------------------------------------**

**--CM registration**

**-----------------------------------------------------------**

--CM registration

CMRegistration ::= SEQUENCE {

--CM IP address

ipAddress OCTET STRING OPTIONAL,

--CM port number

portNumber INTEGER OPTIONAL

}

--List of GCOs for registration

ListOfGCORegistrations ::= SEQUENCE OF SEQUENCE {

--New registration, registration update or deregistration

operationCode OperationCode OPTIONAL,

--GCO ID

gcoID OCTET STRING OPTIONAL,

--Network ID

networkID OCTET STRING OPTIONAL,

--GCO Descriptor

gcoDescriptor GCODescriptor OPTIONAL,

--Coverage area

coverageArea CoverageArea OPTIONAL,

--Installation parameters

installationParameters InstallationParameters OPTIONAL,

--List of available frequencies

listOfAvailableFrequencies ListOfAvailableFrequencies OPTIONAL,

-- List of operating frequencies

listOfOperatingFrequencies ListOfOperatingFrequencies OPTIONAL,

--Maximum number of controllable GCO

maximumNumberOfControllableGCO INTEGER OPTIONAL,

--List of desired performance

listOfDesiredPerformances ListOfDesiredPerformances OPTIONAL,

...

}

--GCO Descriptor

GCODescriptor ::= SEQUENCE {

--Network type

networkType NetworkType OPTIONAL,

--Emission class

emissionClass EmissionClass OPTIONAL,

--GCO type

gcoType GCOType OPTIONAL,

--Network technology

networkTechnology NetworkTechnology OPTIONAL,

--Additional network technologies of GCO

addNetworkTechnologies SEQUENCE OF NetworkTechnology OPTIONAL,

--Regulatory ID of GCO

gcoRegulatoryID OCTET STRING OPTIONAL,

...

}

CoChGCOLimit :: = SEQUENCE {

--Management area

operationRange Range OPTIONAL,

--Maximum number of GCOs given by the coexistence management service

maxNumCoChGCOs INTEGER OPTIONAL

}

--GCO device type

GCOType ::= ENUMERATED {

--“AP” (Access Point)

wlanAP,

--“STA” (Station)

wlanSTA,

--eNB

eNodeB,

--UE

ue,

--“Master” for TVBD/WSD

master,

--“Slave” for TVBD/WSD

slave,

--“CBSD” (Citizens Broadband Radio Service Device)

cbsd,

--“EUD” (End User Device)

eud,

...

}

--Emission class

EmissionClass ::= ENUMERATED {

--“Class 1” as specified in ETSI EN 301 598

class1,

--“Class 2” as specified in ETSI EN 301 598

class2,

--“Class 3” as specified in ETSI EN 301 598

class3,

--“Class 4” as specified in ETSI EN 301 598

class4,

--“Class 5” as specified in ETSI EN 301 598

class5,

...

}

--CE registration

CERegistration ::= SEQUENCE OF SEQUENCE{

--CE ID

ceID CxID OPTIONAL,

-- List of GCO registration

listOfGCORegistrations ListOfGCORegistrations OPTIONAL

}

**-----------------------------------------------------------**

**--Coexistence report**

**-----------------------------------------------------------**

CoexistenceReport ::= SEQUENCE OF SEQUENCE {

networkID OCTET STRING OPTIONAL,

gcoID OCTET STRING OPTIONAL,

listOfRecommendedOperationFrequencies ListOfRecommendedOperationFrequencies OPTIONAL

}

**-----------------------------------------------------------**

**--List of Coexistence reports**

**-----------------------------------------------------------**

ListOfCoexistenceReports ::= SEQUENCE OF SEQUENCE {

--Region information that the following recommended information is valid.

region Region OPTIONAL,

--List of operating frequencies

listOfOperatingFrequencies ListOfOperatingFrequencies OPTIONAL,

--List of recommended information on operation frequencies

listOfRecommendedOperationFrequencies ListOfRecommendedOperationFrequencies OPTIONAL

}

--Network geometry class

NetworkGeometryClass ::= ENUMERATED {

--Class#1 network geometry

class1,

--Class#2 network geometry

class2,

--Class#3 network geometry

class3,

--Class#4 network geometry

class4

}

--List of neighbor GCOs

ListOfNeighborGCOs ::= SEQUENCE OF SEQUENCE {

--Neighbor GCO ID

gcoID OCTET STRING OPTIONAL,

--GCO descriptor

gcoDescriptor GCODescriptor OPTIONAL,

--Network geometry classification

networkGeometryClass NetworkGeometryClass OPTIONAL,

--List of operating frequencies

listOfOperatingFrequencies ListOfOperatingFrequencies OPTIONAL,

--List of available frequencies

listOfAvailableFrequencies ListOfAvailableFrequencies OPTIONAL

}

--List of master CM candidates

ListOfMasterCMCandidates ::= SEQUENCE OF SEQUENCE {

cmID CxID OPTIONAL,

ipAddress OCTET STRING OPTIONAL,

portNumber INTEGER OPTIONAL

}

--List of neighbor CEs

ListOfNeighborCEs ::= SEQUENCE OF SEQUENCE {

--Neighbor CE ID

ceID CxID OPTIONAL,

--List of neighbor GCOs

listOfNeighborGCOs ListOfNeighborGCOs OPTIONAL

}

--List of neighbor CMs

ListOfNeighborCMs ::= SEQUENCE OF SEQUENCE {

--Neighbor CM ID

cmID CxID OPTIONAL,

--List of neighbor CEs

listOfNeighborCEs ListOfNeighborCEs OPTIONAL

}

-- List of recommended operation frequencies

ListOfRecommendedOperationFrequencies ::= SEQUENCE OF SEQUENCE {

--Range of recommended operation frequency

frequencyRange FrequencyRange OPTIONAL,

--Transmission power limit [dBm]

txPowerLimit REAL OPTIONAL,

--Start time

availableStartTime GeneralizedTime OPTIONAL,

--Stop time

availableStopTime GeneralizedTime OPTIONAL,

--Resolution bandwidth [Hz]

resolutionBandwidth REAL OPTIONAL,

--location validity [meter]

locationValidity REAL OPTIONAL,

...

}

**-----------------------------------------------------------**

**--Energy detection information**

**-----------------------------------------------------------**

EnergyDetectionInfo ::= SEQUENCE {

-- Energy detection threshold [dBm]

energyDetectionTh REAL OPTIONAL,

-- Energy detection successful rate

energyDetectionSuccessfulRate REAL OPTIONAL,

-- Percentage of activated cells within one operator over the management region

activationRate REAL OPTIONAL

...

}

-----------------------------------------------------------

--Mobility Information

-----------------------------------------------------------

MobilityInformation :: = CHOICE {

--Maximum speed [km/h]

maxSpeed REAL,

--Speed information

speedInformation SpeedInformation,

--Route information

routeInformation RouteInformation

}

SpeedInformation ::= SEQUENCE {

--GCO speed [km/h]

gcoSpeed REAL OPTIONAL,

--GCO direction [degree]

gcoDirection REAL OPTIONAL

}

RouteInformation ::= SEQUENCE {

plannedRoute SEQUENCE OF Geolocation OPTIONAL,

plannedTime SEQUENCE OF GeneralizedTime OPTIONAL

}

**-----------------------------------------------------------**

**--Entity profile**

**-----------------------------------------------------------**

--Entity profile

EntityProfile ::= ENUMERATED {

--Profile 1

profile1,

--Profile 2

profile2,

--Profile 3

profile3

}

END