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,

 -- operation region

 operationRegion Range 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