IEEE 802.21 Basic Schema
draft-ohba-802dot21-basic-schema-06

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/ietf/1id-abstracts.txt.

The list of Internet-Draft Shadow Directories can be accessed at http://www.ietf.org/shadow.html.

This Internet-Draft will expire on March 13, 2010.

Copyright Notice

Copyright (c) 2009 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust’s Legal Provisions Relating to IETF Documents in effect on the date of publication of this document (http://trustee.ietf.org/license-info). Please review these documents carefully, as they describe your rights and restrictions with respect to this document.
Abstract

This document describes an RDF (Resource Description Framework) schema defined in IEEE 802.21 as the basic schema for Media-Independent Information Service. This document serves as the Specification required by the IANA to maintain a global registry for storing the RDF schema.

Table of Contents

1. Introduction .................................................. 3
2. Acronyms ....................................................... 6
3. RDF Schema for IEEE 802.21 Basic Schema ................. 9
4. Security Considerations ....................................... 48
5. IANA Considerations ............................................ 49
6. Acknowledgments ................................................ 50
7. References ....................................................... 51
   7.1. Normative References ..................................... 51
   7.2. Informative References ................................... 53
Authors’ Addresses ................................................ 55
1. Introduction

IEEE 802.21 is a standard that specifies media independent mechanisms that optimize handovers between heterogeneous IEEE 802 systems and between IEEE 802 systems and cellular systems [802.21].

IEEE 802.21 provides a set of handover-enabling functions within the protocol stacks of the network elements and defines a new entity called the Media-Independent Handover Function (MIHF). A media independent Service Access Point (called the MIH_SAP) and associated primitives are defined to provide MIHF users with access to the services of the MIHF. The MIHF provides the following services: 1) the Media Independent Event Service (MIES) that detects events and delivers triggers from both local as well as remote interfaces, 2) the Media Independent Command Service (MICS) that provides a set of commands for the MIHF users to control handover relevant link states, and 3) the Media Independent Information Service (MIIS) that provides the network elements with the information about neighboring networks, thus enabling more effective handover decisions across heterogeneous networks. The first two services are out of the scope of this document.

The MIIS defines information models and query mechanisms where a query mechanism depends on the information model. There are two types of information models in the MIIS for representing the same set of pre-defined pieces of information in different ways. One information model is based on identifying each piece of information by a unique integer value. The other information model is based on RDF (Resource Description Framework) [RDF] in which each piece of information is identified by a URI (Uniform Resource Identifiers) [RFC3986]. The two information models have different characteristics in terms of namespace management as well as query capabilities. This document is intended for the latter type of information model.

In RDF, an information model is described in the form of an RDF schema [RDFS]. To provide extensibility in terms of defining new pieces of information in addition to the pre-defined ones, the RDF schema definition for MIIS consists of two parts; the basic and the extended schema. An MIHF is pre-provisioned with the basic schema for querying information defined in the IEEE 802.21 specification. The basic schema requires a persistent URL for its definition. An extended schema is used for querying vendor-specific information and it does not require a persistent URL for its definition.

This document describes an RDF schema used for IEEE 802.21 MIIS with some additional texts for clarity and better understanding the content of the schema. This document serves as the Specification required by the IANA to maintain a global registry for storing the
RDF schema [RFC3688]. The original IEEE 802.21 basic schema is defined in Annex H of [802.21]. This document captures few additional points that are mentioned below:

- New <rdfs:comment> tags on the format and semantics of each class and property including more references in the <rdfs:comment> tags are added for clarity.

- Some properties such as dhcp_serv, fn_agent, acc_rtr, proxy_addr_ip and mac_addr that are defined as owl:DatatypeProperty are redefined as owl:ObjectProperty in this document. Also, some properties such as subtype, ie_net_capabilities and ie_net_mob_mgmt_prot that are defined as owl:ObjectProperty are redefined as owl:DatatypeProperty in this document.

- In owl:DatatypeProperty op_namespace of the basic schema in [802.21], the namespace value of one (1) to represent CDMA operator names. Since ITU-T/TSB namespace should be used for CDMA operator names, the namespace value of one (1) allocated to represent CDMA operator names in owl:DatatypeProperty op_namespace of the basic schema is allocated is marked "Unused" in this document.

- The REALM encoding for Unicode used in the basic schema in this document is based on use of the Punycode encoding [RFC3492] as opposed to the REALM encoding scheme defined in [RFC5580] which requires conversion from Unicode to ASCII for non-ASCII characters due to a data type limitation in RADIUS.

- A note is added to mention that a cost_unit of 7 (free) and a cost_unit of 8 (flat rate) with a cost_value of 0 may have different semantics in owl:DatatypeProperty cost_unit.

- A note is added to mention that it is possible to include multiple ie_cost object properties in a single NETWORK class object in owl:ObjectProperty ie_cost.

- A new semantic is added to indicate that an International Mobile Subscriber Identity (IMSI) or a Temporary Mobile Subscriber Identities (TMSI) is used as a _3gpp_addr value in owl:DatatypeProperty _3gpp_addr.

- A new semantic is added to indicate that a Mobile Identification Number (MIN) is used as a _3gpp_addr value in owl:DatatypeProperty _3gpp2_addr.
A new semantic is added to explain the meaning of each bit in owl: DatatypeProperty ie_net_mob_mgmt_prot.

A note is added to mention that it is possible to include multiple ie_poa_subnet_info object properties in a single POA class object in owl:ObjectProperty ie_poa_subnet_info.

A new semantic is added to explain that an MIIS server may advertise different IP subnets to different MIIS clients in owl: Class IP_SUBNET_INFO.

A new semantic is added to indicate that a non-link-local IP address of the PoA is used for owl:ObjectProperty ie_poa_ip_addr.

The datatype of owl:DatatypeProperty eirp is changed from unsignedByte to byte since EIRP can have a negative value.
2. Acronyms

The following acronyms are used in this document.

3GPP: 3rd Generation Partnership Project

CDMA: Code Division Multiple Access

CoS: Class of Service

DCD: Downlink Channel Descriptor

D-TDoA: Differential Time Difference of Arrival

EDGE: Enhanced Data Rates for GSM Evolution

FQDN: Fully Qualified Domain Name

GPRS: General Packet Radio Service

GSM: Global System for Mobile Communication

HELD: HTTP Enabled Location Delivery

HESSID: Homogeneous Extended Service Set ID

HRPD: High Rate Packet Data

HSDPA: High-Speed Downlink Packet Access

HSUPA: High-Speed Uplink Packet Access
ISO: International Organization for Standardization

ITU-T: ITU Telecommunication Standardization Sector

LbyR: Location by Reference

LCI: Location Configuration Information

LCP: Location Configuration Protocol

LLDP: Link Layer Discovery Protocol

MED: Media Endpoint Discovery

MCC: Mobile Country Code

MIMO: Multiple-Input and Multiple-Output

MNC: Mobile Network Code

OFDM: Orthogonal Frequency-Division Multiplexing

OMA: Open Mobile Alliance

OWL: Web Ontology Language

PLMN: Public Land Mobile Network

PN: System Information Block
PoA: Network Point of Attachment

QoS: Quality of Service

RDF: Resource Description Language

UCD: Uplink Channel Descriptor

UMTS: Universal Mobile Telecommunications System

U-TDoA: Uplink Time Difference of Arrival

SIB: System Information Block

SPARQL: The SPARQL Protocol and RDF Query Language

SUPL: Secure User Plane Location

XML: Extensible Markup Language
3. RDF Schema for IEEE 802.21 Basic Schema

<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [ 
<!ENTITY rdf "http://www.w3.org/1999/02/22-rdf-syntax-ns#" 
<!ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#" 
<!ENTITY mihbasic "URL_TO_BE_ASSIGNED" 
<!ENTITY owl "http://www.w3.org/2002/07/owl#" 
<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#"
]> 

<rdf:RDF xmlns:rdf="&rdf;" xmlns:rdfs="&rdfs;" 
xmlns:mihbasic="&mihbasic;" xml:base="&mihbasic;" 
xml:owl="&owl;" xml:xsd="&xsd;">

<owl:Ontology rdf:about="" 
<rdfs:label> 
Basic Schema for IEEE 802.21 Information Service 
rdfs:label> 
<owl:versionInfo>1.0</owl:versionInfo> 
<rdfs:comment>
Section numbers cited in comment tags without a reference to a 
corresponding document are the clause and annex numbers in [802.21].
</rdfs:comment> 
</owl:Ontology> 

<owl:DatatypeProperty rdf:ID="ie_identifier"> 
<rdfs:subPropertyOf rdf:resource="&rdfs;label"/> 
<rdfs:range rdf:resource="&xsd;hexBinary"/> 
<rdfs:comment>
A data type property to represent Information Element identifiers 
defined in Annex G.
</rdfs:comment> 
</owl:DatatypeProperty> 

<owl:DatatypeProperty rdf:ID="bit_number"> 
<rdfs:range rdf:resource="&xsd;unsignedByte"/> 
<rdfs:comment>
A data type property to represent a bit number that has the value 
as true.
</rdfs:comment> 
</owl:DatatypeProperty>
<owl:DatatypeProperty>
<owl:ObjectProperty rdf:ID="ie_container_list_of_networks">
<mibasic:ie_identifier>0x10000300</mibasic:ie_identifier>
<rdfs:range rdf:resource="#LIST_OF_NETWORKS"/>
<rdfs:comment>
An object property to contain a LIST_OF_NETWORKS class object.
</rdfs:comment>
</owl:ObjectProperty>
</owl:Class>

<owl:ObjectProperty rdf:ID="ie_container_network">
<mibasic:ie_identifier>0x10000301</mibasic:ie_identifier>
<rdfs:domain rdf:resource="#LIST_OF_NETWORKS"/>
<rdfs:range rdf:resource="#NETWORK"/>
<rdfs:comment>
An object property of LIST_OF_NETWORKS to contain a NETWORK class object.
</rdfs:comment>
</owl:ObjectProperty>
</owl:Class>

<owl:Class rdf:ID="NETWORK">
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#ie_network_type"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
</owl:Class>
<owl:Restriction>
  <owl:onProperty rdf:resource="#ie_operator_id"/>
  <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:comment>
A class to represent an Access Network Container containing information that depicts an access network.
</rdfs:comment>
</owl:Class>

<owl:ObjectProperty rdf:ID="ie_network_type">
  <mihbasic:ie_identifier>0x10000000</mihbasic:ie_identifier>
  <rdfs:domain rdf:resource="#NETWORK"/>
  <rdfs:range rdf:resource="#NETWORK_TYPE"/>
  <rdfs:comment>
An object property of NETWORK to contain a NETWORK_TYPE class object.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="NETWORK_TYPE">
  <rdfs:comment>
A class to represent a network type.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="link_type">
  <rdfs:domain rdf:resource="#NETWORK_TYPE"/>
  <rdfs:range rdf:resource="&xsd;unsignedByte"/>
  <rdfs:comment>
A data type property of NETWORK_TYPE to represent a link type. The following values are assigned:
  1: Wireless - GSM
  2: Wireless - GPRS
  3: Wireless - EDGE
  15: Ethernet - IEEE 802.3
  18: Wireless - Other
  19: Wireless - IEEE 802.11
</rdfs:comment>
</owl:DatatypeProperty>
A data type property of NETWORK_TYPE to represent a network subtype.

The following values are assigned for Ethernet - IEEE 802.3:

- Bit 0: 10 Mb
- Bit 1: 100 Mb
- Bit 2: 1000 Mb
- Bit 3-63: (Reserved)

The above bits represent the link speeds that Ethernet supports. The capability information of twisted pair Ethernet link can be obtained via auto-negotiation as defined in Clause 28 of the 1998 edition of IEEE Std 802.3.

The following values are assigned for Wireless - IEEE 802.11:

- Bit 0: 2.4 GHz
- Bit 1: 5 GHz
- Bit 2: 4.9 GHz
- Bit 3: 3.65 GHz
- Bit 4: 316 THz
- Bit 5-63 (Reserved)

The above bits represent the frequency band that IEEE 802.11 link supports. The capability information and extended capabilities information of IEEE 802.11 link can further be represented as defined in 7.3.1.4 and 7.3.2.27, respectively, of IEEE Std 802.11-2007.

The following values are assigned for Wireless - UMTS:

- Bit 0: Rel-99
Bit 1: Rel-4
Bit 2: Rel-5 (w/ HSDPA)
Bit 3: Rel-6 (w/ HSUPA)
Bit 4: Rel-7 (MIMO/OFDM)
Bit 5: Rel-8
Bit 6-63: (Reserved)

The following values are assigned for Wireless - cdma2000-HRPD

Bit 0: Rev-0
Bit 1: Rev-A
Bit 2: Rev-B
Bit 3: Rev-C
Bit 4-63: (Reserved)

</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="type_ext">
<rdfs:domain rdf:resource="#NETWORK_TYPE"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of NETWORK_TYPE to represent a generic type extension contained indicating a flexible length and format field. The content is to be defined and filled by the appropriate standard or service provider consortium, etc. The value is a non-NUL terminated string whose length shall not exceed 253 octets. All further allocations of type_ext values are a matter for the IEEE only.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_operator_id">
<mihbasic:ie_identifier>0x10000001</mihbasic:ie_identifier>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:range rdf:resource="#OPERATOR_ID"/>
<rdfs:comment>
An object property of NETWORK to contain a OPERATOR_ID class object.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="OPERATOR_ID">
<rdfs:subClassOf>
<owl:Restriction>
  <owl:onProperty rdf:resource="#op_name"/>
  <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>

<rdfs:subClassOf>
<owl:Restriction>
  <owl:onProperty rdf:resource="#op_namespace"/>
  <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>

<rdfs:comment>
A class to represent an operator identifier.
</rdfs:comment>

</owl:Class>

<owl:DatatypeProperty rdf:ID="op_name">
  <rdfs:domain rdf:resource="#OPERATOR_ID"/>
  <rdfs:range rdf:resource="&xsd;string"/>
</owl:DatatypeProperty>

A data type property of OPERATOR_ID to represent an operator name. The value is a non-NULL terminated string whose length shall not exceed 253 octets.

</rdfs:comment>

</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="op_namespace">
  <rdfs:domain rdf:resource="#OPERATOR_ID"/>
  <rdfs:range rdf:resource="&xsd;unsignedByte"/>
</owl:DatatypeProperty>

A data type property of OPERATOR_ID to represent the namespace of op_name. The following values are assigned:

0: GSM/UMTS

This namespace indicates operator names based on Transferred Account Data Interchange Group (TADIG) codes defined in GSM Association Document TD.13. The TADIG Code consists of two fields, with a total length of five ASCII characters consisting of a three-character country code and a two-character alphanumeric operator (or company) ID.
1: Unused

This namespace is unused.

2: REALM

The REALM operator namespace indicates operator names based on any registered domain name. Such names are required to be unique and the rights to use a given realm name are obtained coincident with acquiring the rights to use a particular Fully Qualified Domain Name (FQDN). Since this operator is limited to ASCII, any registered domain name that contains non-ASCII characters must be converted to ASCII. The Punycode encoding (IETF RFC 3492) is used for this purpose.

3: ITU-T/TSB

This namespace indicates operator names based on the Mobile Country Code (MCC) and Mobile Network Code (MNC) defined in ITU-T E.212. The MCC/MNC values are assigned by the Telecommunications Standardization Bureau (TSB) within the ITU-T and designated administrators in different countries. The E.212 value consists of three ASCII digits containing the MCC, followed by two or three ASCII digits containing the MNC.

4: General

This namespace indicates operator names that are not represented in any of GSM/UMTS, REALM and ITU-T/TSB.

</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="ie_service_provider_id">
<mihbasic:ie_identifier>0x10000002</mihbasic:ie_identifier>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of NETWORK to represent a service provider identifier. A service provider identifier is a non-NULL terminated string whose length shall not exceed 253 octets.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="ie_country_code">
A data type property of NETWORK to represent a two-letter country code defined in ISO 3166-1.

A data type property of NETWORK to represent a network identifier. A network identifier is any non-NULL terminated string whose length shall not exceed 253 octets.

A data type property of NETWORK to represent an auxiliary network identifier. An auxiliary network identifier is homogeneous extended service set ID (HESSID) if network type is IEEE 802.11.

An object property of NETWORK to contain an OPERATOR_ID class object for a roaming partner.
<owl:ObjectProperty rdf:ID="ie_cost">
<mihbasic:ie_identifier>0x10000103</mihbasic:ie_identifier>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:range rdf:resource="#COST"/>
<rdfs:comment>
An object property of NETWORK to contain a COST class object. It
is possible to include multiple ie_cost object properties in a
single NETWORK class object.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="COST">
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#cost_unit"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#cost_value"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#cost_curr"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:comment>
A class to represent a cost for service or network usage.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="cost_unit">
<rdfs:domain rdf:resource="#COST"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of COST to represent the unit of a cost.
</rdfs:comment>
</owl:DatatypeProperty>
The following values are assigned:

0: second
1: minute
2: hours
3: day
4: week
5: month
6: year
7: free
8: flat rate
9-255: (Reserved)

Note that a cost_unit of 7 (free) and a cost_unit of 8 (flat rate) with a cost_value of 0 may have different semantics. For example, the latter may require subscriber authentication while the former may not.
An object property of NETWORK to contain a QOS_LIST class object.

A class to represent a list of measured QoS parameters. See Annex B for definition of each QoS parameter.

A data type property of QOS_LIST to represent the number of QoS types.

A class to represent a Class of Service (CoS).
<owl:DatatypeProperty rdf:ID="cos_id">
    <rdfs:domain rdf:resource="#COS"/>
    <rdfs:range rdf:resource="&xsd;unsignedByte"/>
    <rdfs:comment>
        A data type property of COS to represent a CoS identifier.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cos_value">
    <rdfs:domain rdf:resource="#COS"/>
    <rdfs:range rdf:resource="&xsd;unsignedShort"/>
    <rdfs:comment>
        A data type property of COS to represent a QoS parameter value of a specific CoS.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="min_pk_tx_delay">
    <rdfs:domain rdf:resource="#QOS_LIST"/>
    <rdfs:range rdf:resource="#COS"/>
    <rdfs:comment>
        An object property of QOS_LIST to contain a COS class object for the minimum packet transfer delay in ms.
    </rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="avg_pk_tx_delay">
    <rdfs:domain rdf:resource="#QOS_LIST"/>
    <rdfs:range rdf:resource="#COS"/>
    <rdfs:comment>
        An object property of QOS_LIST to contain a COS class object for the average packet transfer delay in ms.
    </rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="max_pk_tx_delay">
    <rdfs:domain rdf:resource="#QOS_LIST"/>
    <rdfs:range rdf:resource="#COS"/>
    <rdfs:comment>
        An object property of QOS_LIST to contain a COS class object for the maximum packet transfer delay in ms.
    </rdfs:comment>
</owl:ObjectProperty>
<rdfs:comment>
An object property of QOS_LIST to contain a COS class object for the maximum packet transfer delay in ms.
</rdfs:comment>

<owl:ObjectProperty rdf:ID="pk_delay_jitter">
<rdfs:domain rdf:resource="#QOS_LIST"/>
<rdfs:range rdf:resource="#COS"/>
<rdfs:comment>
An object property of QOS_LIST to contain a COS class object for the packet transfer delay jitter in ms.
</rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="pk_loss_rate">
<rdfs:domain rdf:resource="#QOS_LIST"/>
<rdfs:range rdf:resource="#COS"/>
<rdfs:comment>
An object property of QOS_LIST to contain a COS class object for the packet loss rate. The loss rate is equal to the integer part of the result of multiplying -100 times the log10 of the ratio between the number of packets lost and the total number of packets transmitted in the class population of interest.
</rdfs:comment>
</owl:ObjectProperty>

<owl:DatatypeProperty rdf:ID="ie_network_data_rate">
<mihbasic:ie_identifier>0x10000106</mihbasic:ie_identifier>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
A data type property of NETWORK to represent a data rate in kb/s.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_net_regulat_domain">
<mihbasic:ie_identifier>0x10000107</mihbasic:ie_identifier>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:range rdf:resource="#REGU_DOMAIN"/>
<rdfs:comment>
An object property of NETWORK to contain a REGU_DOMAIN class object.
</rdfs:comment>

<owl:ObjectProperty>

<owl:Class rdf:ID="REGU_DOMAIN">
<owl:Restriction>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
<owl:Restriction>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>

A class to represent a regulatory domain.
</rdfs:comment>

<owl:DatatypeProperty rdf:ID="regu_domain_country_code">
<owl:Restriction>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>

A data type property of REGU_DOMAIN to represent the country code of a regulatory domain. The country code is a two-letter country code defined in ISO 3166-1.
</rdfs:comment>

<owl:DatatypeProperty rdf:ID="regu_class">
<A data type property of REGU_DOMAIN to represent the regulatory class. The regulatory class values are defined in Annex J of IEEE
A data type property of NETWORK to represent a frequency band in KHz.

An object property of NETWORK to contain an IP_CONFIG class object.

A class to represent IP configuration information.
A data type property of IP_CONFIG to represent IP configuration methods. The following values are assigned:

- Bit 0: IPv4 static configuration
- Bit 1: IPv4 dynamic configuration (DHCPv4)
- Bit 2: Mobile IPv4 with foreign agent care-of address (FA-CoA)
- Bit 3: Mobile IPv4 without FA (Co-located CoA)
- Bits 4-10: reserved for IPv4 address configurations
- Bit 11: IPv6 stateless address configuration
- Bit 12: IPv6 stateful address configuration (DHCPv6)
- Bit 13: IPv6 manual configuration
- Bits 14-31: (Reserved)

An object property of IP_CONFIG to contain a TRANSPORT_ADDR class object for an IP address of a candidate DHCP Server. It is included only when the corresponding bit in ip_cfg_mthds for dynamic address configuration is set.

An object property of IP_CONFIG to contain a TRANSPORT_ADDR class object for an IP address of a candidate Foreign Agent. It is included only when the corresponding bit in ip_cfg_mthds for Mobile IPv4 is set.

An object property of IP_CONFIG to contain a TRANSPORT_ADDR class
object for an IP address of an candidate Access Router. It is included only when the corresponding bit in ip_cfg_mthds for IPv6 Stateless configuration is set.

</rdfs:comment>
</owl:ObjectProperty>

<owl:DatatypeProperty rdf:ID="ie_net_capabilities">
<mihbasic:ie_identifier>0x1000010A</mihbasic:ie_identifier>
<rdfs:subPropertyOf rdf:resource="#bit_number"/>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:comment>
A data type property of NETWORK to represent network capabilities.

Bit 0: Security - Indicates that some level of security (e.g., link-layer ciphering) is supported when set.

Bit 1: QoS Class 0 - Indicates that QoS for class 0 is supported when set.

Bit 2: QoS Class 1 - Indicates that QoS for class 1 is supported when set.

Bit 3: QoS Class 2 - Indicates that QoS for class 2 is supported when set; Otherwise, no QoS for class 2 support is available.

Bit 4: QoS Class 3 - Indicates that QoS for class 3 is supported when set; Otherwise, no QoS for class 3 support is available.

Bit 5: QoS Class 4 - Indicates that QoS for class 4 is supported when set; Otherwise, no QoS for class 4 support is available.

Bit 6: QoS Class 5 - Indicates that QoS for class 5 is supported when set; Otherwise, no QoS for class 5 support is available.

Bit 7: Internet Access - Indicates that Internet access is supported when set; Otherwise, no Internet access support is available.

Bit 8: Emergency Services - Indicates that some level of emergency services is supported when set; Otherwise, no emergency service support is available.

Bit 9: MIH Capability - Indicates that MIH is supported when set; Otherwise, no MIH support is available.

Bit 10-31: (Reserved)
A data type property of NETWORK to represent a location configuration protocol (LCP).

0: NULL
1: LLDP (Link Layer Discovery Protocol) [802.1AB]
2: LbyR (Location by Reference) with LLDP
3-10: (Reserved)
11: LLDP-MED (Media Endpoint Discovery) [LLDP-MED]
12: LbyR with LLDP-MED
13-20: (Reserved)
21: U-TDoA (Uplink Time Difference of Arrival)
22: D-TDoA (Differential Time Difference of Arrival)
23-30: (Reserved)
31: DHCP [RFC3825]
32: LbyR with DHCP [I-D.ietf-geopriv-dhcp-lbyr-uri-option]
33-40: (Reserved)
41: OMA (Open Mobile Alliance) SUPL [SUPL]
42: IEEE 802.11 [802.11]
43: LbyR with IEEE 802.11
44-50: (Reserved)
51: HELD (HTTP Enabled Location Delivery) [I-D.ietf-geopriv-http-location-delivery]
52: LbyR with HELD
53-255: (Reserved)

A data type property of NETWORK to represent information on supported mobility management protocols. The following values are assigned.

Bit 0: Mobile IPv4 (IETF RFC 3344)
When this bit is set, it indicates the network has a Mobile IPv4 Home Agent.

Bit 1: Mobile IPv4 Regional Registration (IETF RFC 4857)

When this bit is set, it indicates the network has a Gateway Foreign Agent (GFA) and supports Mobile IPv4 Regional Registration.

Bit 2: Mobile IPv6 (IETF RFC 3775)

When this bit is set, it indicates the network has a Mobile IPv6 Home Agent.

Bit 3: Hierarchical Mobile IPv6 (IETF RFC 4140)

When this bit is set, it indicates the network has a Mobile IPv6 Mobile Anchor Point (MAP).

Bit 4: Low Latency Handoffs (IETF RFC 4881)

When this bit is set, it indicates the network supports Mobile IPv4 fast handover.

Bit 5: Mobile IPv6 Fast Handovers (IETF RFC 5268)

When this bit is set, it indicates the network supports Mobile IPv6 fast handover.

Bit 6: IKEv2 Mobility and Multihoming Protocol (IETF RFC 4555)

When this bit is set, it indicates the network has a Mobile IP home-agent like node that supports MOBIKE.

Bit 7-15: (Reserved)

</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_net_emserv_proxy">
<mibbasic:ie_identifier>0x1000010D</mibbasic:ie_identifier>
<rdfs:domain rdf:resource="#NETWORK"/>
<rdfs:range rdf:resource="#PROXY_ADDR"/>
<rdfs:comment>

An object property of NETWORK to contain a PROXY_ADDR class object for the proxy providing access to public safety answering point (PSAP).

<owl:Class rdf:ID="PROXY_ADDR">
  <rdfs:comment>
    A class to represent an L3 address of a proxy.
  </rdfs:comment>
</owl:Class>

<owl:ObjectProperty rdf:ID="proxy_addr_ip">
  <rdfs:domain rdf:resource="#PROXY_ADDR"/>
  <rdfs:range rdf:resource="#TRANSPORT_ADDR"/>
  <rdfs:comment>
    An object property of PROXY_ADDR to contain a TRANSPORT_ADDR class object for an IP address of a proxy.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:DatatypeProperty rdf:ID="proxy_addr_fqdn">
  <rdfs:domain rdf:resource="#PROXY_ADDR"/>
  <rdfs:range rdf:resource="&xsd;String"/>
  <rdfs:comment>
    A data type property of PROXY_ADDR to represent an FQDN of a proxy.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_net_ims_proxy_cscf">
  <mihbasic:ie_identifier>0x1000010E</mihbasic:ie_identifier>
  <rdfs:domain rdf:resource="#NETWORK"/>
  <rdfs:range rdf:resource="#PROXY_ADDR"/>
  <rdfs:comment>
    An object property of NETWORK to contain a PROXY_ADDR class object for a 3GPP Proxy Call Session Control Function (P-CSCF).
  </rdfs:comment>
</owl:ObjectProperty>

<owl:DatatypeProperty rdf:ID="ie_net_mobile_network">
  <mihbasic:ie_identifier>0x1000010F</mihbasic:ie_identifier>
  <rdfs:domain rdf:resource="#NETWORK"/>
A data type property of NETWORK to represent whether the access network itself is mobile.

An object property of NETWORK to contain a POA class object.
</rdfs:subClassOf>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="#ie_poa_subnet_info"/>
    <owl:minCardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:minCardinality>
  </owl:Restriction>
</rdfs:subClassOf>
<rdfs:comment>
A class to represent all the information depicting a network point of attachment (PoA).
</rdfs:comment>
</owl:Class>

<owl:ObjectProperty rdf:ID="ie_poa_link_addr">
  <mihbasic:ie_identifier>0x10000200</mihbasic:ie_identifier>
  <rdfs:domain rdf:resource="#POA"/>
  <rdfs:range rdf:resource="#LINK_ADDR"/>
  <rdfs:comment>
    An object property of POA to contain a LINK_ADDR class object.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="LINK_ADDR">
  <rdfs:comment>
    A class to represent a link-layer address.
  </rdfs:comment>
</owl:Class>

<owl:ObjectProperty rdf:ID="mac_addr">
  <rdfs:domain rdf:resource="#LINK_ADDR"/>
  <rdfs:range rdf:resource="#TRANSPORT_ADDR"/>
  <rdfs:comment>
    An object property of LINK_ADDR to contain a TRANSPORT_ADDR class object for an IEEE 802 Media Access Control (MAC) address.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="LINK_ADDR_3GPP_3G">
  <rdfs:subClassOf rdf:resource="#LINK_ADDR"/>
</owl:Class>
<rdfs:comment>
A class to represent a 3GPP 3G PoA.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="link_addr_3gpp_3g_cell_id_plmn_id">
<rdfs:domain rdf:resource="#LINK_ADDR_3GPP_3G"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of LINK_ADDR_3GPP_3G to represent a 3GPP Public Land Mobile Network (PLMN) Identifier. The coding of PLMN Identifier is specified in 3GPP TS 23.003.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="link_addr_3gpp_3g_cell_id_cell_id">
<rdfs:domain rdf:resource="#LINK_ADDR_3GPP_3G"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
A data type property of LINK_ADDR_3GPP_3G to represent a UTRAN/GERAN Cell Identity (UC-Id) that is a concatenation of RNC Identifier (RNC-Id) and Cell Identity (C-Id). The coding of UC-Id is specified in 3GPP TS 25.401.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:Class rdf:ID="LINK_ADDR_3GPP_2G">
<rdfs:subClassOf rdf:resource="#LINK_ADDR"/>
<rdfs:comment>
A class to represent a 3GPP 2G PoA.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="link_addr_3gpp_2g_cell_id_lac">
<rdfs:domain rdf:resource="#LINK_ADDR_3GPP_2G"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of LINK_ADDR_3GPP_2G to represent a Location Area Code (LAC). A LAC is a fixed length code (of 2 octets)
identifying a location area within a PLMN, as defined in 3GPP TS 23.003.

</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="link_addr_3gpp_2g_cell_id_ci">
<rdfs:domain rdf:resource="#LINK_ADDR_3GPP_2G"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of LINK_ADDR_3GPP_2G to represent a Cell Identity (CI), as defined in 3GPP TS 23.003.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="_3gpp_addr">
<rdfs:domain rdf:resource="#LINK_ADDR"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of LINK_ADDR to represent a 3GPP transport address. This is an International Mobile Subscriber Identity (IMSI) or a Temporary Mobile Subscriber Identities (TMSI) defined in 3GPP TS 23.003.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="_3gpp2_addr">
<rdfs:domain rdf:resource="#LINK_ADDR"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of LINK_ADDR to represent a 3GPP2 transport address. This is a Mobile Identification Number (MIN) defined in 3GPP2 C.S0005-D.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="link_addr_other_l2_addr">
<rdfs:domain rdf:resource="#LINK_ADDR"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A data type property of LINK_ADDR to represent a link layer address

other than that is used for IEEE 802, 3GPP or 3GPP2.

</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_poa_location">
<mihbasic:ie_identifier>0x10000201</mihbasic:ie_identifier>
<rdfs:domain rdf:resource="#POA"/>
<rdfs:range rdf:resource="#LOCATION"/>
<rdfs:comment>
An object property of POA to contain a LOCATION class object.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="LOCATION">
<rdfs:comment>
A class to represent location information.
</rdfs:comment>
</owl:Class>

<owl:Class rdf:ID="BIN_GEO_LOC">
<rdfs:subClassOf rdf:resource="#LOCATION"/>
<rdfs:comment>
A class to represent Location Configuration Information (LCI) defined in RFC 3825.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="la_res">
<rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of BIN_GEO_LOC to represent LaRes (latitude resolution) of LCI. See RFC 3825 for values and semantics.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="latitude">
<rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
<rdfs:range rdf:resource="&xsd;double"/>
<rdfs:comment>
</rdfs:comment>
</owl:DatatypeProperty>
<rdfs:comment>
A data type property of BIN_GEO_LOC to represent Latitude of LCI. See RFC 3825 for values and semantics.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="lo_res">
<rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of BIN_GEO_LOC to represent LoRes (longitude resolution) of LCI. See RFC 3825 for values and semantics.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="longitude">
<rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
<rdfs:range rdf:resource="&xsd;double"/>
<rdfs:comment>
A data type property of BIN_GEO_LOC to represent Longitude of LCI. See RFC 3825 for values and semantics.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="at">
<rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of BIN_GEO_LOC to represent At (Altitude type) of LCI. See RFC 3825 for values and semantics.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="alt_res">
<rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of BIN_GEO_LOC to represent AltRes (Altitude resolution) of LCI. See RFC 3825 for values and semantics.
</rdfs:comment>
</owl:DatatypeProperty>
<owl:DatatypeProperty rdf:ID="altitude">
    <rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
    <rdfs:range rdf:resource="&xsd;double"/>
    <rdfs:comment>
        A data type property of BIN_GEO_LOC to represent Altitude of LCI. See RFC 3825 for values and semantics.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="datum">
    <rdfs:domain rdf:resource="#BIN_GEO_LOC"/>
    <rdfs:range rdf:resource="&xsd;unsignedByte"/>
    <rdfs:comment>
        A data type property of BIN_GEO_LOC to represent Datum of LCI. See RFC 3825 for values and semantics.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:Class rdf:ID="XML_GEO_LOC">
    <rdfs:subClassOf rdf:resource="#LOCATION"/>
    <rdfs:comment>
        A class to represent XML-formatted geospatial location information.
    </rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="xml_geo_loc">
    <rdfs:domain rdf:resource="#XML_GEO_LOC"/>
    <rdfs:range rdf:resource="&xsd;string"/>
    <rdfs:comment>
        A data type property of XML_GEO_LOC to represent Geo address elements as described in RFC 4119.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:Class rdf:ID="BIN_CIVIC_LOC">
    <rdfs:subClassOf rdf:resource="#LOCATION"/>
    <rdfs:comment>
    </rdfs:comment>
</owl:Class>
A class to represent civic address equivalent to Civic Addresses Configuration Information defined in RFC 4676.

</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="civic_cntry_code">
  <rdfs:domain rdf:resource="#BIN_CIVIC_LOC"/>
  <rdfs:range rdf:resource="&xsd;string"/>
  <rdfs:comment>
    A data type property of BIN_CIVIC_LOC to represent a two-letter ISO 3166-1 country code.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="civic_addr">
  <rdfs:domain rdf:resource="#BIN_CIVIC_LOC"/>
  <rdfs:range rdf:resource="#CIVIC_ADDR"/>
  <rdfs:comment>
    An object property of CIVIC_ADDR to contain a CIVIC_ADDER class object.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="CIVIC_ADDR">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#catype"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#cavalue"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
  </rdfs:subClassOf>
  <rdfs:comment>
    A class to represent a civic address element defined in RFC 4676.
  </rdfs:comment>
</owl:Class>
<owl:DatatypeProperty rdf:ID="catype">
  <rdfs:domain rdf:resource="#CIVIC_ADDR"/>
  <rdfs:range rdf:resource="&xsd;unsignedByte"/>
  <rdfs:comment>
  A data type property of CIVIC_LOC to represent a CAtype (Civice Address type) of a civic address element. See RFC 4676 for values and semantics.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cavalue">
  <rdfs:domain rdf:resource="#CIVIC_ADDR"/>
  <rdfs:range rdf:resource="&xsd;string"/>
  <rdfs:comment>
  A data type property of CIVIC_LOC to represent a CAvalue (Civic Address value) of a civic address element. See RFC 4676 for values and semantics.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:Class rdf:ID="XML_CIVIC_LOC">
  <rdfs:subClassOf rdf:resource="#LOCATION"/>
  <rdfs:comment>
  A class to represent XML-formatted civic address location information.
  </rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="xml_civic_loc">
  <rdfs:domain rdf:resource="#XML_CIVIC_LOC"/>
  <rdfs:range rdf:resource="&xsd;string"/>
  <rdfs:comment>
  A data type property of XML_CIVIC_LOC to represent XML-formatted civic address location information as described in RFC 4119.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:Class rdf:ID="LOCATION_CELL_ID">
A class to represent a cell identifier as location information.

</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="location_cell_id">
<rdfs:domain rdf:resource="#LOCATION_CELL_ID"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
</owl:DatatypeProperty>

A class to represent a UTRAN/GERAN Cell Identity (UC-Id) as location information.

</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_poa_channel_range">
<mibbasic:ie_identifier>0x10000202</mibbasic:ie_identifier>
<rdfs:domain rdf:resource="#POA"/>
<rdfs:range rdf:resource="#CH_RANGE"/>
</owl:ObjectProperty>

An object property of POA to contain a CH_RANGE class object.

</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="CH_RANGE">
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#low_ch_range"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#high_ch_range"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
</owl:Class>
A class to represent a channel range.

A data type property of CH_RANGE to represent the lowest channel frequency in MHz.

A data type property of CH_RANGE to represent the highest channel frequency in MHz.

An object property of POA to contain a SYSTEM_INFO class object.

A class to represent system information.
<owl:ObjectProperty rdf:ID="system_info_network_type">
  <rdfs:domain rdf:resource="#SYSTEM_INFO"/>
  <rdfs:range rdf:resource="#NETWORK_TYPE"/>
  <rdfs:comment>
    An object property of SYSTEM_INFO to contain a NETWORK_TYPE object.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="system_info_link_addr">
  <rdfs:domain rdf:resource="#SYSTEM_INFO"/>
  <rdfs:range rdf:resource="#LINK_ADDR"/>
  <rdfs:comment>
    An object property of SYSTEM_INFO to contain a LINK_ADDR class object.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="system_info_parameters">
  <rdfs:domain rdf:resource="#SYSTEM_INFO"/>
  <rdfs:range rdf:resource="#PARAMETERS"/>
  <rdfs:comment>
    An object property of SYSTEM_INFO to contain a PARAMETERS class object.
  </rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="PARAMETERS">
  <rdfs:comment>
    A class to represent system information depending on the network type.
  </rdfs:comment>
</owl:Class>

<owl:Class rdf:ID="DCD_UCD">
  <rdfs:subClassOf rdf:resource="#PARAMETERS"/>
  <rdfs:comment>
    A class to represent the downlink channel descriptor and the uplink channel descriptor in IEEE 802.16.
A data type property of DCD_UCD to represent IEEE 802.16 base station identifier.

A data type property of DCD_UCD to represent IEEE 802.16 channel bandwidth in kb/s.

A data type property of DCD_UCD to represent an IEEE 802.16 Downlink/Uplink center frequency in KHz.

A data type property of DCD_UCD to represent an IEEE 802.16 base station’s effective isotropic radiated power level. A signed value of 8 bits in units of 1 dBm.
<owl:DatatypeProperty rdf:ID="ttg">
    <rdfs:domain rdf:resource="#DCD_UCD"/>
    <rdfs:range rdf:resource="&xsd;unsignedShort"/>
    <rdfs:comment>
        A data type property of DCD_UCD to represent an IEEE 802.16 TTG - transmit/receive transition gap.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="rtg">
    <rdfs:domain rdf:resource="#DCD_UCD"/>
    <rdfs:range rdf:resource="&xsd;unsignedByte"/>
    <rdfs:comment>
        A data type property of DCD_UCD to represent an IEEE 802.16 RTG - receive/transmit transition gap.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="down_bp">
    <rdfs:subPropertyOf rdf:resource="#bit_number"/>
    <rdfs:domain rdf:resource="#DCD_UCD"/>
    <rdfs:comment>
        A data type property of DCD_UCD to represent an IEEE 802.16 list of FEC Code Type for Downlink burst. See IEEE 802.16Rev2/D5.0.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="up_bp">
    <rdfs:subPropertyOf rdf:resource="#bit_number"/>
    <rdfs:domain rdf:resource="#DCD_UCD"/>
    <rdfs:comment>
        A data type property of DCD_UCD to represent an IEEE 802.16 list of FEC Code Type for Uplink burst. See IEEE 802.16Rev2/D5.0.
    </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="init_code">
    <rdfs:domain rdf:resource="#DCD_UCD"/>
    <rdfs:range rdf:resource="&xsd;unsignedByte"/>
    <rdfs:comment>
    </rdfs:comment>
</owl:DatatypeProperty>
A data type property of DCD_UCD to represent an IEEE 802.16 initial ranging code. See IEEE 802.16Rev2/D5.0.

</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="ho_code">
<rdfs:domain rdf:resource="#DCD_UCD"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of DCD_UCD to represent an IEEE 802.16 handover ranging code. See IEEE 802.16Rev2/D5.0.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:Class rdf:ID="SIB">
<rdfs:subClassOf rdf:resource="#PARAMETERS"/>
<rdfs:comment>
A class to represent UMTS system information block (SIB).
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="sib_cell_id">
<rdfs:domain rdf:resource="#SIB"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
A data type property of SIB to represent a UTRAN/GERAN Cell Identity (UC-Id).
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="fq_code_num">
<rdfs:domain rdf:resource="#SIB"/>
<rdfs:range rdf:resource="&xsd;unsignedShort"/>
<rdfs:comment>
A data type property of SIB to represent UMTS scrambling code, cdma2000 Walsh code.
</rdfs:comment>
</owl:DatatypeProperty>
<owl:Class rdf:ID="SYS_PARAMS">
  <rdfs:subClassOf rdf:resource="#PARAMETERS"/>
  <rdfs:comment>
    A class to represent cdma2000 system parameters.
  </rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="sys_params_base_id">
  <rdfs:domain rdf:resource="#SYS_PARAMS"/>
  <rdfs:range rdf:resource="&xsd;unsignedShort"/>
  <rdfs:comment>
    A data type property of SYS_PARAMS to represent a cdma2000 base station identification as defined in 3GPP2 C.S0005-D.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="pilot_pn">
  <rdfs:domain rdf:resource="#SYS_PARAMS"/>
  <rdfs:range rdf:resource="&xsd;unsignedShort"/>
  <rdfs:comment>
    A data type property of SYS_PARAMS to represent a cdma2000 Pilot PN (Pseudo Noise) sequence offset index as defined in 3GPP2 C.S0005-D.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="freq_id">
  <rdfs:domain rdf:resource="#SYS_PARAMS"/>
  <rdfs:range rdf:resource="&xsd;unsignedShort"/>
  <rdfs:comment>
    A data type property of SYS_PARAMS to represent a cdma2000 carrier frequency identifier as defined in 3GPP2 C.S0002-D.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="band_class">
  <rdfs:domain rdf:resource="#SYS_PARAMS"/>
  <rdfs:range rdf:resource="&xsd;unsignedByte"/>
  <rdfs:comment>
    A data type property of SYS_PARAMS to represent a cdma2000 band
  </rdfs:comment>
</owl:DatatypeProperty>
class as defined in 3GPP2 C.S0005-D.

</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="ie_poa_subnet_info">
<mibbasic:ie_identifier>0x10000204</mibbasic:ie_identifier>
<rdfs:domain rdf:resource="#POA"/>
<rdfs:range rdf:resource="#IP_SUBNET_INFO"/>
<rdfs:comment>
An object property of POA to contain an IP_SUBNET_INFO class object. It is possible to include multiple ie_poa_subnet_info object properties in a single POA class object.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="IP_SUBNET_INFO">
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#ip_prefix_len"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:subClassOf>
<owl:Restriction>
<owl:onProperty rdf:resource="#subnet_address"/>
<owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>
<rdfs:comment>
A class to represent an IP subnet information. An MIIS server may advertise different IP subnets to different MIIS clients.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="ip_prefix_len">
<rdfs:domain rdf:resource="#IP_SUBNET_INFO"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
A data type property of IP_SUBNET_INFO to represent the bit length of the prefix of the subnet to which subnet_address property
belongs. The prefix_length is less than or equal to 32 for IPv4 subnet and less than or equal to 128 for IPv6 subnet.

</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="subnet_address"
  <rdfs:domain rdf:resource="#IP_SUBNET_INFO"/>
  <rdfs:range rdf:resource="#TRANSPORT_ADDR"/>
  <rdfs:comment>
An object property of IP_SUBNET_INFO to contain a TRANSPORT_ADDR class object for an IP subnet address of the PoA encoded as Address base type defined in RFC3588. The first 2-octet contains AddressType, which may be either 1 (IPv4) or 2 (IPv6). If AddressType=1, the subnet_address property contains a 4-octet IPv4 address. If AddressType=2, the subnet_address property contains a 16-octet IPv6 address.
</rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="ie_poa_ip_addr"
  <mihbasic:ie_identifier>0x10000205</mihbasic:ie_identifier>
  <rdfs:domain rdf:resource="#POA"/>
  <rdfs:range rdf:resource="#TRANSPORT_ADDR"/>
  <rdfs:comment>
An object property of POA to contain a TRANSPORT_ADDR class object for a non-link-local IP address of the PoA encoded as Address base type defined in RFC3588. The first 2-octet contains AddressType, which may be either 1 (IPv4) or 2 (IPv6). If AddressType=1, the subnet_address property contains a 4-octet IPv4 address. If AddressType=2, the subnet_address property contains a 16-octet IPv6 address. It is possible to include multiple ie_poa_ip_addr object properties (i.e., multiple TRANSPORT_ADDR class objects each carrying an IP address) in a single POA class object.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="TRANSPORT_ADDR">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#addr_family"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
  </owl:Restriction>
</owl:Class>
A class to represent a transport address.

A data type property of TRANSPORT_ADDR to represent an Address Family defined in http://www.iana.org/assignments/address-family-numbers.

A data type property of TRANSPORT_ADDR to represent an address value specific to address_family.
4. Security Considerations

Beyond the considerations described in [RFC3688], there are no additional security considerations other than that was already found with any other IANA registry.
5. IANA Considerations

The IEEE 802.21 basic schema requires an IANA-assigned registry for an RDF schema. According to [RFC3688], the following is the information needed by IANA.

URI (please assign)
The URI that identifies the IEEE 802.21 basic schema.

Registrant Contact

Yoshihiro Ohba
Toshiba America Research, Inc.
1 Telcordia Drive
Piscataway, NJ 08854
USA

Phone: +1 732 699 5305
Email: yohba@tari.toshiba.com

XML
The exact XML to be stored in the registry is described in Section 3, except that the word "URL_TO_BE_ASSIGNED" in the XML definition needs to be replaced with IANA-assigned URL for the stored XML.
6. Acknowledgments

We would like to thank IEEE 802.21 Working Group members and Jari Arkko for their detailed review of the 802.21 basic schema.
7. References

7.1. Normative References


[ISO4217] International Organization for Standardizations (ISO), "Codes for the Representation of Names of Countries".


[802.11k] Institute of Electrical and Electronics Engineers, "IEEE Std 802.11k-2008, Information Technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements; Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications; Amendment
1: Radio Resource Measurement of Wireless LANs.",

[802.16] Institute of Electrical and Electronics Engineers, "IEEE
Std 802.16-2004, Information Technology-
Telecommunications and information exchange between
system-Local and metropolitan area networks-Specific
Requirements-Part 16: Air Interface for Fixed Broadband
Wireless Access Systems.", IEEE Standard 802.16-2004,
2004.

[802.16Rev2]
Institute of Electrical and Electronics Engineers, "DRAFT
Standard for Local and metropolitan area networks Part 16:
Air Interface for Broadband Wireless Access Systems",

[3GPP-TS23003]
3GPP, "3rd Generation Partnership Project; Technical
Specification Group Core Network and Terminals; Numbering,
addressing and identification", 3GPP TS 23.003.

[3GPP-TS25401]
3GPP, "3rd Generation Partnership Project; Technical
Specification Group Radio Access Network; UTRAN overall
description", 3GPP TS 25.401.

[3GPP-TS25413]
3GPP, "3rd Generation Partnership Project; Technical
Specification Group Radio Access Network; UTRAN Iu
interface RANAP signalling", 3GPP TS 25.413.

[3GPP2-CS0002-D]
3GPP2, "Physical Layer Standard for cdma2000 Spread
Spectrum Systems Revision D", 3GPP2 C.S0002-D.

[3GPP2-CS0005-D]
3GPP2, "Upper Layer (Layer 3) Signaling Standard for
cdma2000 Spread Spectrum Systems Release D",
3GPP2 C.S0005-D.

[GSM] GSM Association, "TADIG Naming Conventions, Version 4.1",
GSM Association TD.13.

[E212] ITU Telecommunication Standardization Sector, "The
international identification plan for mobile terminals and
7.2. Informative References


[SUPL] Open Mobile Alliance, "OMA Secure User Plane Location V2.0 (http://www.openmobilealliance.org/Technical/release_program/supl_v2_0.aspx)".
Authors’ Addresses

Kenichi Taniuchi
Toshiba Corporate R&D Center
1, Komukai-Toshiba-cho, Saiwai-ku
Kawasaki, Kanagawa 212-8582
Japan
Phone: +81 44 549 2230
Email: kenichi.taniuchi@toshiba.co.jp

Yoshihiro Ohba
Toshiba Corporate R&D Center
1, Komukai-Toshiba-cho, Saiwai-ku
Kawasaki, Kanagawa 212-8582
Japan
Phone: +81 44 549 2230
Email: yoshihiro.ohba@toshiba.co.jp

Subir Das
Telcordia
1 Telcordia Drive
Piscataway, NJ 08854
USA
Phone: +1 732 699 2483
Email: subir@research.telcordia.com