IEEE 802.21 Basic Schema
draft-ohba-802dot21-basic-schema-00

Status of this Memo

By submitting this Internet-Draft, each author represents that any applicable patent or other IPR claims of which he or she is aware have been or will be disclosed, and any of which he or she becomes aware will be disclosed, in accordance with Section 6 of 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 July 20, 2007.

Copyright Notice

Copyright (C) The Internet Society (2007).
Abstract

This document describes the basic schema for IEEE 802.21 Media-Independent Information Service, an RDF (Resource Description Framework) schema defined in IEEE 802.21. 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. RDF Schema for IEEE 802.21 Basic Schema .................... 5
3. Security Considerations ....................................... 26
4. IANA Considerations ........................................... 27
5. Acknowledgments ............................................... 28
6. References ..................................................... 29
   6.1. Normative References ...................................... 29
   6.2. Informative References ................................... 29
Authors’ Addresses ............................................... 30
Intellectual Property and Copyright Statements .................. 31
1. Introduction

IEEE 802.21 is a standard that specifies 802 media access–independent mechanisms that optimize handovers between heterogeneous 802 systems and between 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 a new entity created therein called the MIH 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) detects events and delivers triggers from both local as well as remote interfaces. 2) The Media Independent Command Service (MICS) provides a set of commands for the MIHF users to control handover relevant link states. 3) The Media Independent Information Service (MIIS) provides the network elements with the information about neighboring networks, thus enabling making of 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 which it is based on. There are two types of information models in the MIIS for representing the same set of pre-defined information elements in different ways. One information model is based on TLV (Type-Length-Value) in which information elements are identified by integer values. The other information model is based on RDF (Resource Description Framework) [RDF] in which information elements are identified by URIs (Uniform Resource Identifiers) [RFC3986]. The two information models have different characteristics in terms of namespace management as well as query capability. This document is intended for the latter type of information model.

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

This document describes the IEEE 802.21 basic schema, an RDF schema used for IEEE 802.21 MIIS. This document serves as the Specification required by the IANA to maintain a global registry for storing the
RDF schema [RFC3688]. The basic schema definition is described in Section 2. Information required by IANA for assigning a global registry for the basic schema is described in Section 4.
2. RDF Schema for IEEE 802.21 Basic Schema

```xml
<?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 mibbasic "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:mibbasic="&mibbasic;" 
xml:base="&mibbasic;" xmlns:owl="&owl;" xmlns:xsd="&xsd;">

<owl:Ontology rdf:about="">
  <rdfs:label>
  Basic Schema for IEEE 802.21 Information Service
  </rdfs:label>
</owl:Ontology>

<owl:Class rdf:ID="Network">
  <rdfs:label>TYPE_IE_CONTAINER_NETWORK</rdfs:label>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#network-type"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
  </rdfs:subClassOf>

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

  <rdfs:comment>
  This class contains all the information depicting an access network.
  </rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="network-type">
  <rdfs:label>TYPE_IE_NETWORK_TYPE</rdfs:label>
  <rdfs:domain rdf:resource="#Network"/>
```
Link type of a network. The following values are assigned:
15: Ethernet
18: Wireless - Other
19: Wireless - IEEE 802.11
22: Wireless - CDMA2000
23: Wireless - UMTS
24: Wireless - 1X-EV
27: Wireless - IEEE 802.16
1: REALM
2: CDMA
3: ITU-T/TSB
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="operator-name">
  <rdfs:label>OperatorName</rdfs:label>
  <rdfs:domain rdf:resource="#Operator-Identifier"/>
  <rdfs:range rdf:resource="&xsd;string"/>
  <rdfs:comment>
    The value of OperatorName. The value is a non NULL terminated string whose length shall not exceed 253 octets. The value uniquely identifies the operator name within the scope of the OperatorNamespace.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="service-provider-identifier">
  <rdfs:label>TYPE_IE_SERVICE_PROVIDER_IDENTIFIER</rdfs:label>
  <rdfs:domain rdf:resource="#Network"/>
  <rdfs:range rdf:resource="&xsd;string"/>
  <rdfs:comment>
    Identifier for the service provider. The value is a non NULL terminated string whose length shall not exceed 253 octets. The value uniquely identifies the service provider.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="access-network-identifier">
  <rdfs:label>TYPE_IE_ACCESS_NETWORK_IDENTIFIER</rdfs:label>
  <rdfs:domain rdf:resource="#Network"/>
  <rdfs:range rdf:resource="&xsd;string"/>
  <rdfs:comment>
    Identifier of the Access Network. This is used to uniquely identify the access network. As an example for 802.11 (WLAN) networks this is the ESSID.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="roaming-partner">
  <rdfs:label>TYPE_IE_ROAMING_PARTNERS</rdfs:label>
  <rdfs:domain rdf:resource="#Network"/>
  <rdfs:range rdf:resource="#Operator-Identifier"/>
  <rdfs:comment>
    An identifier of an operator with which the current network operator has direct roaming agreements.
  </rdfs:comment>
</owl:ObjectProperty>
<owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="cost">
<rdfs:label>TYPE_IE_COST</rdfs:label>
<rdfs:domain rdf:resource="#Network"/>
<rdfs:range rdf:resource="#Cost"/>
</owl:ObjectProperty>

<owl:Class rdf:ID="Cost">
<rdfs:comment>
Cost Indication of cost for service or network usage
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="unit">
<rdfs:label>Unit</rdfs:label>
<rdfs:domain rdf:resource="#Cost"/>
<rdfs:range rdf:resource="&xsd;unsignedByte"/>
<rdfs:comment>
The unit of the cost:
0: second
1: minute
2: hours
3: day
4: month
5: year
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="value">
<rdfs:label>Value</rdfs:label>
<rdfs:domain rdf:resource="#Cost"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
The cost value in Currency/Unit
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="currency">
<rdfs:label>Currency</rdfs:label>
<rdfs:domain rdf:resource="#Cost"/>
<rdfs:range rdf:resource="&xsd;string"/>
<rdfs:comment>
A non NULL terminated string representing the currency value. The
size of the string is derived using the Length of the Information
elements.
</rdfs:comment>
</owl:DatatypeProperty>
<owl:Class rdf:ID="Bitmap">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#bit-number"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="#bit-value"/>
        <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
      </owl:Restriction>
      <rdfs:comment>
        This class is used for bitmap type value of IE.
      </rdfs:comment>
    </rdfs:subClassOf>
  </rdfs:subClassOf>
  <owl:DatatypeProperty rdf:ID="bit-number">
    <rdfs:label>Bit Number</rdfs:label>
    <rdfs:domain rdf:resource="#Bitmap"/>
    <rdfs:range rdf:resource="&xsd;unsignedByte"/>
    <rdfs:comment>
      This property represents a bit number of a bitmap value.
    </rdfs:comment>
  </owl:DatatypeProperty>
  <owl:DatatypeProperty rdf:ID="bit-value">
    <rdfs:label>Bit Value</rdfs:label>
    <rdfs:domain rdf:resource="#Bitmap"/>
    <rdfs:range rdf:resource="&xsd;boolean"/>
    <rdfs:comment>
      This property represents a value of a bitmap value.
    </rdfs:comment>
  </owl:DatatypeProperty>
  <owl:ObjectProperty rdf:ID="network-standards">
    <rdfs:label>TYPE_IE_NETWORK_STANDARDS</rdfs:label>
    <rdfs:domain rdf:resource="#Network"/>
    <rdfs:range rdf:resource="#Bitmap"/>
    <rdfs:comment>
      Access Network specific applicable revisions to the base access network standard. For 802 networks, this is the list of specific revisions applicable for that access network. For cellular networks, this represents the release version of the standard that
    </rdfs:comment>
  </owl:ObjectProperty>
</owl:Class>
is applicable. The bitmap value depends on Network Type:

Network Type: Wireless - IEEE 802.11

(PHY/MAC Features)
Bit 0: Access point (AP)
Bit 1: Independent station (not an AP)
Bit 2: FHSS PHY for 2.4GHz band
Bit 3: DSSS PHY for 2.4GHz band
Bit 4: IR PHY
Bit 5: OFDM PHY for 5GHz band
Bit 6: High-speed PHY
Bit 7: Multi-domain operation capability implemented
Bit 8: Extended Rate PHY (ERP)
Bit 9: Spectrum management operation supported
Bit 10: Regulatory class capability implemented
Bit 11: QoS Supported
Bit 12-15: Reserved

(Security Features)
Bit 16: WPA - Enterprise
Bit 17: WPA - Personal
Bit 18: WPA2 - Enterprise
Bit 19: WPA2 - Personal
Bit 20-31: Reserved

(QoS Features)
Bit:32: WMM
Bit:33: WMM Power Save
Bit:34-47:Reserved

(Other Features)
Bit:48-:CWG-RF
Bit:49-63: Reserved

Network Type: Wireless - IEEE 802.16:
Bit 0: 802.16-2001
Bit 1: 802.16c-2002
Bit 2: 802.16a-2003
Bit 3: 802.16-2004
Bit 4: 802.16e-2005
Bit 5: 802.16g-2007
Bit 6-63: Reserved

Network Type: Wireless - CDMA2000:
Bit 0: CDMA-2000-Rev-0
Bit 1: Rev-A
Bit 2: Rev-B
Bit 3: Rev-C
Bit 4: Rev-D
Bit 5-63: Reserved

Network Type: Wireless - UMTS:
Bit 0: GSM
Bit 1: GPRS
Bit 2: EDGE
Bit 3: Rel-99
Bit 4: Rel-4
Bit 5: Rel-5 (w/ HSDPA)
Bit 6: Rel-6 (w/ HSDPA)
Bit 7: Rel-7 (MIMO/OFDM)
Bit 8: Rel-8
Bit 9-63: Reserved
</rdfs:comment>
</owl:ObjectProperty>

<owl:DatatypeProperty rdf:ID="network-security">
<rdfs:label>TYPE_IE_NETWORK_SECURITY</rdfs:label>
<rdfs:domain rdf:resource="#Network"/>
<rdfs:comment>
Authentication Methods and Cipher suites used. The length, format and semantics of this field are specific to each link type and defined by each media-specific WG or SDO. In many cases, this field contains values of media-specific MIB objects used for representing security characteristics of the media.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="network-qos">
<rdfs:label>TYPE_IE_NETWORK_QOS</rdfs:label>
<rdfs:domain rdf:resource="#Network"/>
<rdfs:range rdf:resource="#Network-QoS"/>
<rdfs:comment>
QoS classes and Traffic Specifications.
</rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="Network-QoS">
<rdfs:comment>
This class contains QoS Parameters properties.
</rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="throughput">
<rdfs:label>Throughput</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
The maximum information transfer rate achievable. It is measured in kbps.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="link-packet-error-rate">
<rdfs:label>Link Packet Error Rate</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedShort"/>
<rdfs:comment>
A value equal to integer part of the result of multiplying 100 times the log 10 of the ratio between the number of packets received in error and the total number of packets transmitted in a link population of interest.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="supported-number-of-cos">
<rdfs:label>Supported number of CoS</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedShort"/>
<rdfs:comment>
The maximum number of differentiable classes of service supported.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cos-minimum-packet-transfer-delay">
<rdfs:label>CoS Minimum Packet Transfer Delay</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
This is an encoded value which contains the class of service identifier in the 2 most significant octets and the minimum packet transfer delay for the class in ms in the two least significant octets. Valid range for minimum packet transfer delay: [0..65535] ms.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cos-average-packet-transfer-delay">
<rdfs:label>CoS Average Packet Transfer Delay</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
This is an encoded value which contains the class of service identifier in the 2 most significant octets and the average packet transfer delay for the class in ms in the two least significant
octets. Valid range for average packet transfer delay: [0..65535] ms.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cos-maximum-packet-transfer-delay">
<rdfs:label>CoS Maximum Packet Transfer Delay</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
This is an encoded value which contains the class of service identifier in the 2 most significant octets and the maximum packet transfer delay for the class in ms in the two least significant octets. Valid range for maximum packet transfer delay: [0..65535] ms.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cos-packet-transfer-jitter">
<rdfs:label>CoS Packet Transfer Delay Jitter</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
This is an encoded value which contains the class of service identifier in the 2 most significant octets and the packet transfer delay jitter for the class in ms in the two least significant octets. Valid range for packet transfer delay jitter: [0..65535] ms.
</rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="cos-packet-loss-rate">
<rdfs:label>CoS Packet Loss Rate</rdfs:label>
<rdfs:domain rdf:resource="#Network-QoS"/>
<rdfs:range rdf:resource="&xsd;unsignedInt"/>
<rdfs:comment>
This is an encoded value which contains the class of service identifier in the 2 most significant octets and a value equal to integer part of the result of multiplying 100 times the log 10 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:DatatypeProperty>

<owl:Class rdf:ID="PoA">
<rdfs:label>TYPE_IE_CONTAINER_POA</rdfs:label>
</owl:Class>
<owl:Restriction>
  <owl:onProperty rdf:resource="#poa-address"/>
  <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
  </owl:cardinality>
</owl:Restriction>

<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="#poa-location"/>
    <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
    </owl:cardinality>
  </owl:Restriction>
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#poa-data-rate"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
      </owl:cardinality>
    </owl:Restriction>
    <rdfs:subClassOf>
      <owl:Restriction>
        <owl:onProperty rdf:resource="#poa-channel-range"/>
        <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
        </owl:cardinality>
      </owl:Restriction>
      <rdfs:subClassOf>
        <owl:Restriction>
          <owl:onProperty rdf:resource="#poa-subnet-information"/>
          <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
          </owl:cardinality>
        </owl:Restriction>
        <rdfs:subClassOf>
          <owl:Restriction>
            <owl:onProperty rdf:resource="#poa-ip-config-methods"/>
            <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1
            </owl:cardinality>
          </owl:Restriction>
          <rdfs:subClassOf>
          </rdfs:subClassOf>
        </rdfs:subClassOf>
      </rdfs:subClassOf>
    </rdfs:subClassOf>
  </rdfs:subClassOf>
</rdfs:subClassOf>
<owl:Restriction>
    <owl:onProperty rdf:resource="#poa-capabilities"/>
    <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
</owl:Restriction>

<rdfs:comment>
    This class contains all the information depicting a PoA.
</rdfs:comment>

<owl:ObjectProperty rdf:ID="poa">
    <rdfs:domain rdf:resource="#Network"/>
    <rdfs:range rdf:resource="#PoA"/>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="poa-address">
    <rdfs:label>TYPE_IE_POA_ADDRESS</rdfs:label>
    <rdfs:domain rdf:resource="#PoA"/>
    <rdfs:range rdf:resource="#Address"/>
    <rdfs:comment>
        This property contains a link-specific identifier of PoA.
    </rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="poa-location">
    <rdfs:label>TYPE_IE_POA_LOCATION</rdfs:label>
    <rdfs:domain rdf:resource="#PoA"/>
    <rdfs:range rdf:resource="#PoA-Location"/>
    <rdfs:comment>
        This class has properties that indicate a location of PoA. Geospatial-location-information and civic-location-information are supported by default. Any additional location type can be added to this class in an extended schema.
    </rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="PoA-Location">
</owl:Class>

<owl:ObjectProperty rdf:ID="geospatial-location-information">
    <rdfs:label>Geospatial Location Information</rdfs:label>
    <rdfs:domain rdf:resource="#PoA-Location"/>
    <rdfs:range rdf:resource="#Geospatial-Location-Information"/>
    <rdfs:comment>
        Geospatial location information of a PoA.
    </rdfs:comment>
</owl:ObjectProperty>
<owl:ObjectProperty>

<owl:Class rdf:ID="Geospatial-Location-Information">
  <rdfs:comment>
  This class has properties that represent geographic coordinate. The format is based on the Location Configuration Information (LCI) defined in RFC 3825.
  </rdfs:comment>
</owl:Class>

<owl:DatatypeProperty rdf:ID="latitude-resolution">
  <rdfs:label>Latitude Resolution</rdfs:label>
  <rdfs:domain rdf:resource="#Geospatial-Location-Information"/>
  <rdfs:range rdf:resource="&xsd;unsignedByte"/>
  <rdfs:comment>
  Latitude resolution. 6 bits indicating the number of valid bits in the fixed-point value of Latitude. Any bits entered to the right of this limit should not be considered valid and might be purposely false, or zeroed by the sender.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="latitude">
  <rdfs:label>Latitude</rdfs:label>
  <rdfs:domain rdf:resource="#Geospatial-Location-Information"/>
  <rdfs:range rdf:resource="&xsd;hexBinary"/>
  <rdfs:comment>
  A 34 bit fixed point value consisting of 9 bits of integer and 25 bits of fraction. Latitude should be normalized to within +/- 90 degrees. Positive numbers are north of the equator and negative numbers are south of the equator.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="longitude-resolution">
  <rdfs:label>Longitude Resolution</rdfs:label>
  <rdfs:domain rdf:resource="#Geospatial-Location-Information"/>
  <rdfs:range rdf:resource="&xsd;unsignedByte"/>
  <rdfs:comment>
  Longitude resolution. 6 bits indicating the number of valid bits in the fixed-point value of Longitude. This value is the number of high-order Longitude bits that should be considered valid. Any bits entered to the right of this limit should not be considered valid and might be purposely false, or zeroed by the sender.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="longitude">
  <rdfs:label>Longitude</rdfs:label>
  <rdfs:domain rdf:resource="#Geospatial-Location-Information"/>
  <rdfs:range rdf:resource="&xsd;hexBinary"/>
  <rdfs:comment>
  A 34 bit fixed point value consisting of 9 bits of integer and 25 bits of fraction. Longitude should be normalized to within +/- 180 degrees. Positive numbers are east of the prime meridian and negative numbers are west of the prime meridian.
  </rdfs:comment>
</owl:DatatypeProperty>
A 34 bit fixed point value consisting of 9 bits of integer and 25 bits of fraction. Longitude should be normalized to within +/- 180 degrees. Positive values are East of the prime meridian and negative (2s complement) numbers are West of the prime meridian.

Following codes are defined:

1: Meters: in 2s-complement fixed-point 22-bit integer part with 8-bit fraction. If AT = 1, an AltRes value 0.0 would indicate unknown altitude. The most precise Altitude would have an AltRes value of 30. Many values of AltRes would obscure any variation due to vertical datum differences.

2: Floors: in 2s-complement fixed-point 22-bit integer part with 8-bit fraction. AT = 2 for Floors enables representing altitude in a form more relevant in buildings which have different floor-to-floor dimensions.
Following codes are defined:
1: WGS
3: NAD 83 (with associated vertical datum for Mean Lower Low Water (MLLW))
This property contains the civic address elements. The format of the civic address elements is described in Section 3.4 of IETF RFC 4676 with a TLV pair (whereby the Type and Length fields are one octet long).

A one-octet descriptor of the data civic address value.

The civic address value.

A one-octet descriptor of the data civic address value.
Way location information was derived or discovered:
0: GPS
1: Assisted GPS
2: Manual
3: Provided by DHCP
4: Triangulation
5: Cell
6: IEEE 802.11 WLAN Access Point
7-255: Reserved
<owl:DatatypeProperty rdf:ID="low-channel-range">
  <rdfs:label>Low Channel Range</rdfs:label>
  <rdfs:domain rdf:resource="#PoA-Channel-Range"/>
  <rdfs:range rdf:resource="&xsd;unsignedInt"/>
  <rdfs:comment>
    Lowest channel frequency in MHz
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="high-channel-range">
  <rdfs:label>High Channel Range</rdfs:label>
  <rdfs:domain rdf:resource="#PoA-Channel-Range"/>
  <rdfs:range rdf:resource="&xsd;unsignedInt"/>
  <rdfs:comment>
    Highest channel frequency in MHz
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:ObjectProperty rdf:ID="poa-subnet-information">
  <rdfs:label>TYPE_IE_SUBNET_INFORMATION</rdfs:label>
  <rdfs:domain rdf:resource="#PoA"/>
  <rdfs:range rdf:resource="#PoA-Subnet-Information"/>
  <rdfs:comment>
    Information about a subnet supported by a PoA
  </rdfs:comment>
</owl:ObjectProperty>

<owl:Class rdf:ID="PoA-Subnet-Information">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#subnet-address"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>

<owl:Class rdf:ID="PoA-Subnet-Information">
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#prefix-length"/>
      <owl:cardinality rdf:datatype="&xsd;nonNegativeInteger">1</owl:cardinality>
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>

<owl:ObjectProperty rdf:ID="subnet-address">
  <rdfs:label>Subnet Address</rdfs:label>
  <rdfs:domain rdf:resource="#PoA-Subnet-Information"/>
An 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.

Prefix Length

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.

PoA IP configuration support Information.
<owl:Restriction>
  <owl:onProperty rdf:resource="#poa-fa-ar-address"/>
  <owl:maxCardinality rdf:datatype="&xsd;nonNegativeInteger">1
  </owl:maxCardinality>
</owl:Restriction>
</rdfs:subClassOf>
</owl:Class>

<owl:ObjectProperty rdf:ID="ip-config-methods-bitmap">
  <rdfs:label>IP config methods Bitmap</rdfs:label>
  <rdfs:domain rdf:resource="#PoA"/>
  <rdfs:range rdf:resource="#Bitmap"/>
  <rdfs:comment>
This field contains a Bitmap Class. IP_config_methods_bitmap indicating what IP configuration methods are supported by the PoA:

Bit 0: IPv4 static configuration
Bit 1: IPv4 dynamic configuration (DHCPv4)
Bit 2: Mobile IPv4 with FA (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.
</rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="poa-dhcp-address">
  <rdfs:label>TYPE_IE_POA_DHCP_ADDRESS</rdfs:label>
  <rdfs:domain rdf:resource="#PoA-IP-Config-Methods"/>
  <rdfs:range rdf:resource="#Address"/>
  <rdfs:comment>
Provides an optional DHCP server address when "IPv4 dynamic configuration (DHCPv4)", "Mobile IPv4 without FA(Co-located CoA)" or "IPv6 stateful address configuration (DHCPv6)" is supported. Contains a DHCP server address of either IPv4 or IPv6 that a DHCP can contact parameters) of the network the PoA belongs. When "IPv4 dynamic configuration (DHCPv4)", "Mobile IPv4 without FA(Co-located CoA)" or "IPv6 stateful address configuration (DHCPv6)" is supported, an optional TYPE_IE_POA_DHCP_ADDRESS IE may be included to allow pre-configuration of IP address.
</rdfs:comment>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:ID="poa-fa-ar-address">
  <rdfs:label>TYPE_IE_POA_FA_AR_ADDRESS</rdfs:label>
</owl:ObjectProperty>
Provides an optional foreign agent or access router address, when "Mobile IPv4 with FA (FA-CoA)" or "IPv6 stateless address configuration" is supported. Contains the value of foreign agent or access router address of either IPv4 or IPv6 that a Mobile IP client or IPv6 client using stateless address configuration can contact and obtain a valid IP address of the network the PoA belongs. When "Mobile IPv4 with FA (FA-CoA)" or "IPv6 stateless address configuration" is supported, an optional TYPE_IE_POA_FA_AR_ADDRESS IE indicating a foreign agent or access router address may be included to allow pre-configuration of IP address.

PoA Capability bitmap represented by Bitmap Class
Bit 0: Security Y/N
Bit 1: QoS Y/N
Bit 2: Internet Access Y/N
Bit 3: Emergency Services Y/N
Bit 4: MIH Capability Y/N
Bit 5: IP Version 6 Prefix Available Y/N
Bit 6-31 : Reserved

IP Address (4-octet for IPv4 or 16-octet for IPv6). This IE is used only for a PoA that has an IP address.
</owl:cardinality>
</owl:Restriction>
</rdfs:subClassOf>

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

<owl:DatatypeProperty rdf:ID="address-type">
  <rdfs:label>Address Type</rdfs:label>
  <rdfs:domain rdf:resource="#Address"/>
  <rdfs:range rdf:resource="&xsd;unsignedShort"/>
  <rdfs:comment>
    An Address Family defined in
    http://www.iana.org/assignments/address-family-numbers.
  </rdfs:comment>
</owl:DatatypeProperty>

<owl:DatatypeProperty rdf:ID="address">
  <rdfs:label>Address</rdfs:label>
  <rdfs:domain rdf:resource="#Address"/>
  <rdfs:range rdf:resource="&xsd;hexBinary"/>
  <rdfs:comment>
    An address value specific to address-type.
  </rdfs:comment>
</owl:DatatypeProperty>
</owl:DatatypeProperty>
</rdf:RDF>
3. 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.
4. 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 5365
Email: yohba@tari.toshiba.com

XML
The exact XML to be stored in the registry is described in Section 2, except that the word "URL_TO_BE_ASSIGNED" in the XML definition needs to be replaced with IANA-assigned URL for the stored XML.
5. Acknowledgments

TBD.
6. References

6.1. Normative References


6.2. Informative References


Authors’ Addresses

Kenichi Taniuchi
Toshiba America Research, Inc.
1 Telcordia Drive
Piscataway, NJ 08854
USA

Phone: +1 732 699 5365
Email: yohba@tari.toshiba.com

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

Phone: +1 732 699 5365
Email: yohba@tari.toshiba.com

Subir Das
Telcordia
1 Telcordia Drive
Piscataway, NJ 08854
USA

Phone: +1 732 699 2483
Email: subir@research.telcordia.com