

Project	IEEE 802.16 Registration Authority Issue
Title	Proposed Tutorial on 802.16 Operator ID for IEEE Registration Authority
Date:	2006-09-28
Source(s)	<p>Scott Probasco scott.probasco@nokia.com Nokia</p> <p>6000 Connection Drive, Irving, TX 75039</p> <p style="text-align: right;">As Chairman of the OID Ad Hoc</p>
Re:	IEEE 802.16-06/016r3 (Letter to RAC regarding 802.16)
Abstract	This document is input to Operator ID ad hoc.
Purpose	As the basis of an IEEE Registration Authority to assign Operator IDs per IEEE Std 802.16.
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures < http://ieee802.org/16/ipr/patents/policy.html >, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair < mailto:chair@wirelessman.org > as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site < http://ieee802.org/16/ipr/patents/notices >.

Use of the IEEE ~~assigned 802.16~~ Operator ID with IEEE Std 802.16 ~~Broadband Wireless Access Standards for~~ Wireless Metropolitan Area Networks

General

IEEE Std 802.16 defines a 24-bit ~~number~~ Operator ID to identify the operator of an 802.16 base station. According to the standard, "The 24-bit Operator ID shall be assigned as an IEEE 802.16 Operator ID by the IEEE Registration Authority. The IEEE Registration Authority is the sole authorized number space administrator for this function."

This *Operator ID (OID)* is combined with an additional 24-bit programmable field to define the 48-bit Base Station ID (see subclause 6.3.2.3.2 in IEEE Std 802.16). ~~In IEEE Std 802.16, subclause 6.3.2.3.47 requires that the 24-bit Operator ID be a "Unique ID assigned to the operator."~~

~~Provided that Just as the 24-bit Operator ID operator assigns -unique numbers to the least significant 24-bits of the Base Station Identifier, this results in a globally unique Base Station Identifier, as long as the OID is globally unique, uniquely identifies the operator of an IEEE 802.16 network of base stations from all other operators of IEEE 802.16 networks, in the 48-bit Base Station ID, provision for the 24-bit Operator ID assignment reserves a 24-bit block of programmable identifiers to uniquely identify each base station within one operator network.~~

IEEE 802.16 Operator ID

~~A~~ The IEEE 802.16 Operator ID is a sequence of 24 bits. It is administered by the IEEE Registration Authority in a 24-bit format which is bit compliant with IEEE Std 802.16.

Base Station ID

A Base Station ID is defined as a sequence of 48 bits. The first 24 bits take the values of the 24 bits of the Operator ID in order; the following 24 bits are administered by the base station ~~Operator ID assignee~~.

For example, the Operator ID ~~404044004404444004004000~~ 11111111100111111101000 could be used to generate the following Base Station ID by appending 000000001000000010000000:

```

1010110011011111001001000000000001000000010000000
1111111110011111110100000000001000000010000000
  ||
  |next bit transmitted
first bit transmit          last bit transmitted
    
```

Operator ID Use

There are three use cases for the Operator ID.

1. Globally Unique OID assigned by IEEE

A network may have a number of 802.16 compliant base stations, located in one or more countries. In this case, the operator requires a globally unique OID assigned by the IEEE Registration Authority. Many operators will need only a single Operator ID. An operator may request up to 100 contiguous Operator IDs. The IEEE Registration Authority allocates Operator IDs. The application form is here<insert hyperlink to application form>.

2. Globally Unique OID derived from E.212 MCC-MNC

Many cellular networks make use of the Mobile Country Code – Mobile Network Code (MCC-MNC) format specified by ITU E.212 [1] for network identification. The operator may desire a unique IEEE 802.16 Operator ID based on an existing E.212 assignment. A procedure to map the MCC-MNC format to the OID accommodates any need (e.g., one based on regional regulations) to use an OID derived from an allocation made by a regional allocation authority. This procedure is acceptable only for operators who have been expressly allocated an appropriate MNC, and only within the specified MCC region under the appropriate national authority, according to the E.212 process <<http://www.itu.int/ITU-T/inr/forms/mnc.html>>.

The MCC-MNC is encoded into an IEEE 802.16 Operator ID as follows:

i) The OID shall begin with the bits “1111”

ii) The next 10 bits are a binary representation of the 3 digit decimal number comprising the MCC; e.g. MCC 302 is represented as 0100101110.

iii) The final 10 bits are a binary representation of the 3 digit decimal number comprising the MNC; e.g. MNC 573 is represented as 1000111101.

iv) 2-digit MNCs are encoded as if they are prefixed with zero to create a 3-digit number. This encoding will be unambiguous because no MCC supports both 2- & 3-digit MNCs, per the E.212 requirement [2] that “For a specific shared MCC, the length of all MNCs within that MCC shall be the same.” For example, MNC 38 is encoded as 0000100110; MNC 99 is encoded as 0001100011.

v) Examples:

The E.212 MCC-MNC pair 310-185 would be encoded 1111 0100110110 0010111001.

The E.212 MCC-MNC pair 234-02 would be encoded 1111 0011101010 0000000010.

The E.212 MCC-MNC pair 450-185 would be encoded 1111 0111000010 0010111001.

The IEEE Registration Authority assumes no responsibility for any actions regarding these E-212-derived OIDs, except to specify the algorithm. The IEEE Registration Authority does not maintain a registry of numbers calculated according to this process and does not accept responsibility for arbitrating any disputes.

3. Public OID pool

Networks not offering public service may operate a small number of 802.16 base stations. In such cases, the network operator (which may be, for example, a residential user or a small enterprise) may be tolerant of a nonunique Operator ID. To support such private operators, a large pool of public OIDs is available (see table below) for use without IEEE assignment. Note that these numbers are not globally unique and are not recommended for use in systems providing public service. Commercially available 802.16 base stations for private use should be pre-populated with an OID randomly selected from the public OID pool but allow the operator to reprogram the OID to any value from the Public OID pool, but no other value. This ensures that operators with multiple 802.16 base stations can program all of their base stations to the same Operator ID.

Status	Binary	Hex	Decimal	Notes
First public OID	111111111001111111101000	FF9FE8	16752616	<u>The 24,600 largest numbers in the space, all starting with “1111”, are reserved for the public OID pool.</u>
Last public OID	111111111111111111111111	FFFFFF	16777215	

Operator ID Administration

~~Many operators will only need a single Operator ID. Some operators may deploy hierarchical networks, separate networks or private networks and may therefore need multiple Operator IDs. An operator who needs multiple Operator IDs may request up to 100 contiguous Operator IDs.~~

The Operator ID(s) referenced in the assignee’s IEEE Registration Authority Assignment is described as a 24-bit globally assigned Operator ID and as an integral part of a 48-bit globally assigned Base Station ID. An Operator ID assignment allows the operator to generate approximately 16 million Base Station IDs, by varying the last three octets.

The method that an operator uses to ensure that no two of its Base Stations carry the same ID will, of course, depend on the assignment process, and the operator's philosophy. However, the network selection algorithms may expect Base Stations to have unique IDs. The ultimate responsibility for assuring that expectations and requirements are met, therefore, lies with the operator of the Base Station.

References

[1] ITU-T Recommendation E.212 (05/2004, including Erratum 1 [10 /2004]), “The international identification plan for mobile terminals and mobile users,” May 2004
<<http://www.itu.int/rec/T-REC-E.212/en>>.