Project	**IEEE 802.16 Registration Authority Issue**
Title	**Proposed Tutorial on 802.16 Operator ID for IEEE Registration Authority**
Date:	**2006-09-26**
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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 unique Operator IDs per IEEE Std 802.16.
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Use of the IEEE assigned 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 to identify the operator of an 802.16 base station. This Operator ID 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."~~

Just as the 24-bit Operator ID ~~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.

Operator ID

A Operator ID is a sequence of 24 bits. It is administered by the IEEE 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 Operator ID assignee.

For example, the Operator ID 101011001101111001001000 could be used to generate the following Base Station ID by appending 000000001000000010000000:

```
101011001101111001001000000000001000000010000000
||                                               |
|next bit transmitted                            |
first bit transmit          last bit transmitted
```

Operator ID Use

A public network may have a number of 802.16 compliant base stations, located in one or more countries, that may cooperatively interoperate with other such public networks using radio interfaces operating according to IEEE Std 802.16. In this case, the operator will require a globally unique OID and will require the assignment of one from the number space controlled by the IEEE Registration Authority. Most operators will only need a single Operator ID. Some

operators may deploy hierarchical networks, separate networks or "campus" networks and may therefore need multiple Operator IDs. An operator who needs multiple Operator IDs 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>.

A public network may have a number of 802.16 compliant base stations that may cooperatively interoperate with networks using non-802.16 (e.g., GSM-based) technology. In these cases, the operator may seek an 802.16 OID that is the same as (or is a direct, known, representation of) the operator or network ID used for the non-802.16 network. Specifically, 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. In this case, the operator will require a unique IEEE 802.16 Operator ID based on the unique E.212 assignment. This also accommodates any need (e.g., one based on regional regulations) to use an OID that is derived from an allocation made by a regional allocation authority and indicative of a particular region or country of operation.
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/ITUT/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. MNC 234 is represented as 0011101010.

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 IEEE Registration Authority assume 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.

Private networks may operate 802.16 compliant systems but will not offer public service and may utilize a small number of base stations. In such cases, the network operator (which may be, for example, a residential user or a small enterprise) may not demand a unique assignment and may be tolerant of the possibility that the Operator ID is nonunique. In this case, a large pool of

public OIDs from which private users can choose the Operator ID maximizes the deployment potential for such systems by saving the cost and effort involved in applying for a globally unique ID. Note that these numbers are not globally unique and must therefore be used only in systems not 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. It is a requirement that, per subclause 6.3.2.3.2 of IEEE Std 802.16, the entire Base Station ID (which includes the Operator ID) shall be programmable. This ensures that private users with multiple 802.16 base stations can program all of the Operator IDs to match. A randomly selected OID from the private network space is available here<insert link to random number generator (range: hex FF9FE8; decimal 16752616 through hex FFFFFF; decimal 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.