mac-address format

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Agenda

- Executive Summary
- YANG Definition Difference
- IEEE Definition
- IETF Definition
- Overlap
- Way Forward

Executive Summary

- IETF and IEEE have different patterns for mac-address
  - IETF Format: pattern '[0-9a-fA-F]{2}(:[0-9a-fA-F]{2}){5}';
    - uses ':' as separator
  - IEEE Format: pattern "[0-9a-fA-F]{2}(-[0-9a-fA-F]{2}){5}";
    - uses '-' as separator
    - Also ':' has a defined meaning in IEEE specs (bit-reversal of each hex digit)
- This is not just a YANG issue, it is also in SNMP MIBs

YANG definition difference

dash vs. colon

IEEE

```
typedef mac-address {
  type string {
    pattern "[0-9a-fA-F]{2}(-[0-9a-fA-F]{2}){5}";
  }
  description
    "The mac-address type represents a MAC address in the canonical
    format and hexadecimal format specified by IEEE Std 802.  The
    hexidecimal representation uses uppercase characters.";
  reference
    "3.1 of IEEE Std 802-2014
    8.1 of IEEE Std 802-2014";
}
```

ieee802-types

upper/lower case

IETF

```
typedef mac-address {
  type string {
    pattern '[0-9a-fA-F]{2}(:[0-9a-fA-F]{2}){5}';
  }
  description
   "The mac-address type represents an IEEE 802 MAC address.
    The canonical representation uses lowercase characters.

    In the value set and its semantics, this type is equivalent
    to the MacAddress textual convention of the SMIv2.";
  reference
   "IEEE 802: IEEE Standard for Local and Metropolitan Area
              Networks: Overview and Architecture
    RFC 2579: Textual Conventions for SMIv2";
}
```

ietf-yang-types

IEEE Definitions

- IEEE Std 802-2014 and IEEE Std 802c-2017 provide the IEEE definition of MAC addresses (Clause 8)

- Hyphen: Hexadecimal representation is a sequence of octet values in which the values of the individual octets are displayed in order from left to right, with each octet value represented as a 2-digit hexadecimal numeral and with the resulting pairs of hexadecimal digits separated by hyphens.
- Colon: Bit-reversed representation is a sequence of octet values in which the values of the individual octets are displayed in order from left to right, with each octet value represented as a 2-digit hexadecimal numeral and with the resulting pairs of hexadecimal digits separated by colons.

- By the IEEE Definition for example:
  - AC-DE-48-12-7B-80 in Hexadecimal representation (aka hyphen)
  - is equivalent to
  - 35:7B:12:48:DE:01 in Bit-reversed representation (aka colon)

    - NOTE: AC (hex) is 10101100 (binary) reverse the octets bit order 00110101 (binary) is 35 (hex)

IETF Definition

- The YANG in ietf-yang-types says:
  - The mac-address type represents an IEEE 802 MAC address. The canonical representation uses lowercase characters. In the value set and its semantics, this type is equivalent to the MacAddress textual convention of the SMIv2.“
- The textual convention of SMIv2 says:

```
MacAddress ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "1x:"
    STATUS       current
    DESCRIPTION
            "Represents an 802 MAC address represented in the
            `canonical' order defined by IEEE 802.1a, i.e., as if it
            were transmitted least significant bit first, even though
            802.5 (in contrast to other 802.x protocols) requires MAC
            addresses to be transmitted most significant bit first."
    SYNTAX       OCTET STRING (SIZE (6))
```

The display hint indicates hex format separated by colons (no indication of upper or lower case in the DISPLAY-HINT

Interpretation Differences

- Appears to only be in display format
- The yang:mac-address from the IETF seems to mean the same as the ieee:mac-address
- Operational examples from IETF SNMP does not indicate that the bit order for display purposes is swapped

- However RFC 7042 has this note about
  - This document uses hexadecimal notation. Each octet (that is, 8-bit byte) is represented by two hexadecimal digits giving the value of the octet as an unsigned integer. Successive octets are separated by a hyphen. This document consistently uses IETF bit ordering although the physical order of bit transmission within an octet on an IEEE [802.3] link is from the lowest order bit to the highest order bit (i.e., the reverse of the IETF's ordering).

Concern

- The format used by the IETF does not follow the standard in IEEE Std 802-2014
- The issue has been around

mac-address Next Steps

- Suggestions
  - (Rodney) "Nevertheless, use of colon with non-reversed digits seems to technically violate subclause 8.1. There is no "shall" in that paragraph, but 802 specs often avoid "shall" in normative text. To fix that, personally I think that a subsequent amendment/revision of IEEE 802 needs to move all discussion of bit-reversal to an informative annex. In that informative annex, the document can clarify that historically, use of colon indicated bit reversal, but in modern software colon is also used with canonical format (non-reversal).“
  - (Don) Modify pattern to allow ‘-’ or ‘:’
  - (Marc) Discuss and consider the usage and backwards compatibility and also usage in the industry
  - Others?
- Technical Discussion
  - If hyphen and colon were made equivalent, how would that impact backward compatibility and/or keys/list indexing?
  - Are there any cases where both yang:mac-address and ieee:mac-address could appear in the same YANG tree? What would be the impact?
  - Others?
- Next Steps?
  - Consider Suggestions
  - Deeper Dive into Technical Discussion
  - Consensus on messaging
  - Engagements
    - IETF/IEEE Coordination Engagement
    - IEEE 802.1 Engagement
    - IEEE 802 Engagement

Backup Material

- "Standard Group MAC Addresses“
  - https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/tutorials/macgrp.pdf [standards.ieee.org].
  - In the section "Binary and Hexadecimal Representations of LAN MAC Addresses“
    - "The 48-bit address (universal or local) is represented as a string of six octets. The octets are displayed from left to right, in the order that they are transmitted on the LAN medium, separated by hyphens.".