New OUI Tier Structure and Impact on IEEE 1588 and IEEE 802.1AS

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Introduction - 1

- The attached presentation was given to the IEEE P1588 Upkeep Subcommittee call of July 7, 2014
- The presentation describes the new OUI tier structure introduced by the IEEE Registration Authority (RA) as of January 1, 2014, and its impact on IEEE 1588
  - If a clockIdentity is formed by mapping an EUI-48 that is derived from one of the smaller address blocks to an EUI-64, there is a possibility of clashing (i.e., creating duplicate clockIdentities)
- The presentation outlines several possible approaches for addressing this issue
- The purpose of the presentation was to inform the P1588 WG of these issues, and solicit comments and suggestions
- Since IEEE 802.1AS includes a PTP profile and uses 1588 clockIdentities, the issue is also relevant to 802.1AS
  - Therefore, the presentation is also being made to the 802.1 TSN TG, for information and to solicit comments and/or suggestions

Introduction – 2

- Following the presentation given to the P1588 Upkeep Subcommittee (SC), some comments and suggestions made during and after the presentation (by P1588 Upkeep SC members) are presented

New OUI Tier Structure and Impact on IEEE 1588 (and its Profiles)

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Outline

- Introduction
- Summary of use of OUI in IEEE 1588
- New OUI tier structure
- Possible clashing of clockIdentities when mapping EUI-48 to EUI-64 (to form clockIdentity)
- Some possible solutions
- Next steps

Introduction – 1

- As of January 2014, the IEEE Registration Authority (RA) introduced a new OUI tier structure
  - In addition to the existing OUI and OUI-36 assignments, an assignment that includes an intermediate size block of MAC addresses is now available
  - A new Company ID (CID) is also available
  - The structure was developed in the IEEE Registration Authority Committee (RAC)
- The new structure was introduced as a means of conserving the space of EUI-48s (e.g., MAC addresses) and OUIs
- The new tier structure impacts IEEE 1588 (and PTP profiles) in several ways:
  - If a clockIdentity is formed by mapping an EUI-48 that is derived from one of the smaller address blocks to an EUI-64, there is a possibility of clashing (i.e., creating duplicate clockIdentities)
    - This issue must be addressed
  - In addition, certain text in IEEE 1588 (and IEEE 802.1AS) must be updated to reflect the new tier structure

Introduction – 2

- This presentation describes these issues, and suggests several possible ways of addressing the duplication of clockIdentities
- This presentation is for information

Summary of use of OUI in IEEE 1588 – 1

- There are 4 uses of OUI in PTP
  - Formation of a clockIdentity
  - Identification of a vendor and standard organization TLV
  - Manufacturer identity in CLOCK_DESCRIPTION management TLV
  - Use in profileIdentifier (also referred to as profileIdentity)
- clockIdentity
  - The clockIdentity is an EUI-64; 1588 specifies that the OUI is owned by the organization that creates the clockIdentity
    - The clockIdentity can be formed directly from the OUI, or can be mapped from an EUI-48 owned by the organization creating the clockIdentity by inserting FF-FE between the third and fourth most significant octets of the EUI-48
- Identification of vendor and standard organization TLV
  - An OUI owned by the organization defining the TLV is inserted in the organizationId field

Summary of use of OUI in IEEE 1588 – 2

- Manufacturer identity in CLOCK_DESCRIPTION management TLV
  - An OUI owned by the organization that manufactured the clock is inserted in the manufacturerIdentity field
- Use in profileIdentifier
  - The profileIdentifier is an EUI-48
  - An OUI owned by the organization that defines the profile is inserted in the OUI portion of the EUI-48

Review of Previous OUI Tier Structure – 1

- Prior to the introduction of the new structure, the following identifiers were available from IEEE
  - OUI: 24-bit identifier
    - Used to form EUI-48 (e.g., MAC address), EUI-64 (e.g., 1588 clockIdentity)
      - Provides up to 2^{24} EUI-48s and 2^{40} EUI-64s
    - Also used as 24-bit company/organization ID (e.g., to identify an organization in a 1588 vendor and standard organization TLV, in a PTP profile, etc.)
  - IAB: 36-bit identifier (obsolete as of January 1, 2014)
    - Can only be used to form EUI-48; provides up to 2^{12} (4096) EUI-48s
    - No other uses are allowed by IEEE (e.g., cannot use IAB to form EUI-64s)
    - The IEEE RA would form an IAB (to assign to a customer) by appending 12 bits to an OUI assigned to the RA for the purpose of creating IABs
      - The IEEE RA did not guarantee that each IAB would be formed from the same OUI; however, in practice all the IABs were assigned from two particular OUIs (one was used until all the IABs based on it were assigned; then the other was used)

Review of Previous OUI Tier Structure – 2

- Prior to the introduction of the new structure, the following identifiers were available from IEEE (cont.)
  - OUI-36: 36 bit identifier
    - Used to form EU-48 and EUI-64
      - Provides up to 2^{12} (4096) EUI-48s and 2^{28} EUI-64s (mainly intended for those who did not need a large number of EUI-48s, and also needed other identifiers and thus could not use IAB)
      - Note that while IEEE allows EUI-64s to be formed from an OUI-36, it is not clear whether IEEE 1588 – 2008 allows clockIdentities to be formed from an OUI-36
        - » 1588 states in 7.5.2.2.2 that for devices that use an EUI-64 for the clockIdentity value, the OUI shall be owned by the organization creating the clockIdentity
        - » The question of whether a clockIdentity can be formed from an OUI-36 seems to have not arisen in either the P1588 WG or the 1588 Interpretation Committee that previously existed
        - » However, as will be seen shortly, the issue of creating duplicate clockIdentities from the 28-bit and 36-bit identifiers in the new tier structure would have also existed had 1588 explicitly allowed clockIdentities to be created from an OUI-36
    - OUI-36 also can be used as a 36-bit organization/company ID, though such IDs are not defined in 1588

Review of Previous OUI Tier Structure – 3

- Prior to the introduction of the new structure, the following identifiers were available from IEEE (cont.)
  - OUI-36: 36 bit identifier (cont.)
    - The IEEE RA forms an OUI-36 by appending 12 bits to an OUI assigned to the RA for the purpose of creating OUI-36s
      - The IEEE RA does not guarantee that each OUI-36 is formed from the same OUI
- The only restriction on purchasing an OUI was that, if a purchaser already owned an OUI, they could not purchase another OUI until they had consumed 95% of the EUI-48s of the already-owned OUI
  - Note that there also are restrictions on the uses of EUI-48, e.g., EUI-48s must be used to identify real physical interfaces and not virtual interfaces (see [1] – [3] for details)
- However, a first-time purchases could purchase an OUI, regardless of how many EUI-48s were needed
  - And note that a user that needed a 24-bit company ID would have to obtain an OUI for this purpose, regardless of how many EUI-48s were needed

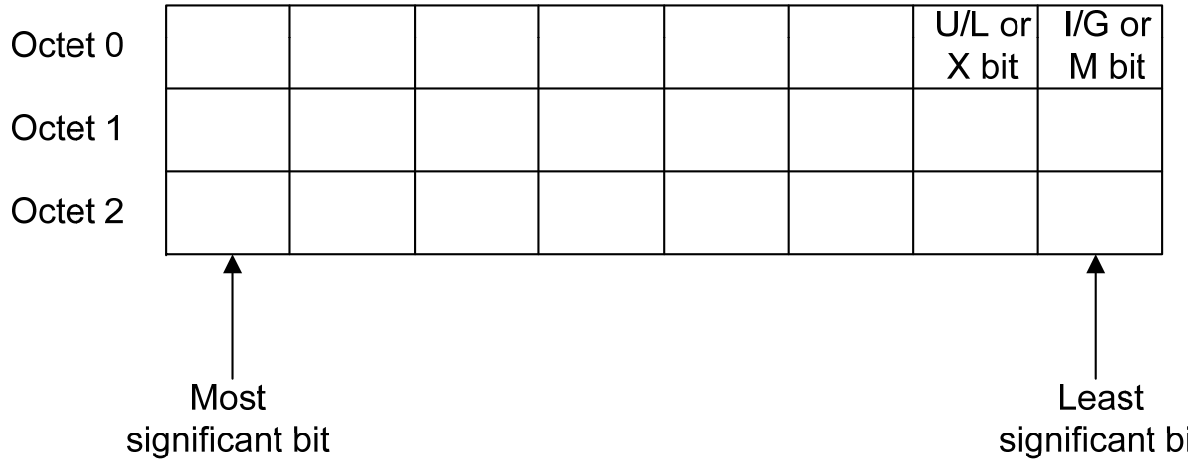
Summary of New OUI Tier Structure – 1

- The new tier structure was introduced with the aim of reducing the rate of consumption of MAC addresses and OUIs
  - See references [1] – [3] for more detail (note that some text here is based on text in [1] – [3]
- The new structure introduced a 28-bit identifier, referred to as “MAC Addresses – Medium” (MA-M), and a 24-bit “Company ID” (CID)
  - The MA-M provides up to 2^{20} EUI-48s and 2^{36} EUI-64s, but does NOT provide a company/organization ID
  - The CID may be used as a 24-bit company/organization ID, but does NOT provide EUI-48s, EUI-64s, or any other identifiers
- In the new structure, the 24-bit assignment from IEEE (OUI) is referred to as “MAC Addresses – Large” (MA-L), though the term “OUI” is retained
- In the new structure, the 36-bit assignment from IEEE (OUI-36) is referred to as “MAC Addresses – Small” (MA-S), though the term “OUI-36” is retained
- The three identifiers (MA-L, MA-M, MA-S) are summarized in the table on the next slide (taken from [1])

Summary of New OUI Tier Structure – 2

IEEE RA Assignment	Number of IEEE-assigned bits	Block size of EUI-48 (may be used as unique 48-bit addresses)	Block size of EUI-64 (may be used as unique 64-bit addresses)	May be used as a company or organization identifier (yes/no)
CID (Company ID)	24	0 (zero)	0 (zero)	yes (24-bit CID)
MAC Addresses – Large (MA-L)	24	2^{24} (16,777,216)	2^{40} (1,099,511,627,776)	yes (24-bit OUI)
MAC Addresses – Medium (MA-M)	28	2^{20} (1,048,576)	2^{36} (68,719,476,736)	no
MAC Addresses – Small (MA-S)	36	2^{12} (4096)	2^{28} (268,435,456)	Yes (36-bit OUI-36 only)

Summary of New OUI Tier Structure – 4



- Structure of OUI and CID is shown in the above figure (taken from [1])
- The least-significant bit octet 0 is the M bit
  - In a MAC address, it indicates an individual or group address
- The second least significant bit of octet 0 is the X bit
  - In a MAC address, it indicates whether the address is universally unique or locally administered
- In an OUI, the M and X bits are both 0
- In a CID, the M bit is 0 and the X bit is 1
  - Note: a very small number of OUI assignments have the X bit equal to 1. These assignments were made prior to the administering of OUIs by IEEE

Summary of New OUI Tier Structure – 5

- With the new OUI tier structure, the RAC has the following policies, which have the aim of reducing the volume of unused EUI-48s (see [1] for details)
  - First-time customers (i.e., assignees) cannot purchase the MA-L. A first-time customer that needs a 24-bit company/organization ID can purchase a CID, and a first-time customer that needs EUI-48s or EUI-64s can purchase MA-M or MA-S. Exception to this policy must be reviewed by the RAC
  - Repeat customers (i.e., customers who have previously purchased an MA-L, MA-M, MA-S, and/or CID) can purchase any of the identifiers upon certification that at least 95% of the current MA-L or MA-M is used. The same applies to OUI assignments issued prior to January 1, 2014. Additional assignments may be issued when a significant portion of the existing MA-S assignment has been exhausted. Customers must agree not to produce products using the new assignment until the previous assignment is fully exhausted. This applies to all registry assignments
  - A customer that has either an MA-L (or prior to January 1, 2014, an OUI) or CID should not need to purchase a new CID
- Note (added by author): while the above doesn't say so explicitly, "exhaustion" refers to EUI-48 assignments, not EUI-64.

EUI-48 and MAC-48 – 1

- IEEE 1588 – 2008 refers to MAC-48 in two places
  - Footnote 11 (p. 49) indicates that MAC-48 (and EUI-48 and EUI-64) assigned numbers may be obtained from the IEEE RA
  - Note 3 on p.50 indicates that the IEEE RA has deprecated the use of MAC-48 in any new design
  - Given these references, we now explain the historical distinction between EUI-48 and MAC-48 and the current status of MAC-48 (taken from [1])
- Historically, both EUI-48 and MAC-48 were concatenations of a 24-bit OUI assigned by the IEEE RA and a 24-bit extension identifier assigned by the organization with that OUI assignment
  - However, MAC-48 was used to identify hardware instances within 802-based networking applications
  - EUI-48 was used to identify design instances (e.g., software interface standards such VGA, model number of a product, etc.)
  - The subtle difference between EUI-48 and MAC-48 was not well understood; as a result, the term MAC-48 is now obsolete and the term EUI-48 is used for both uses (but the terms “MAC” and “MAC address” are still used)

Mapping EUI-48 to EUI-64 – 1

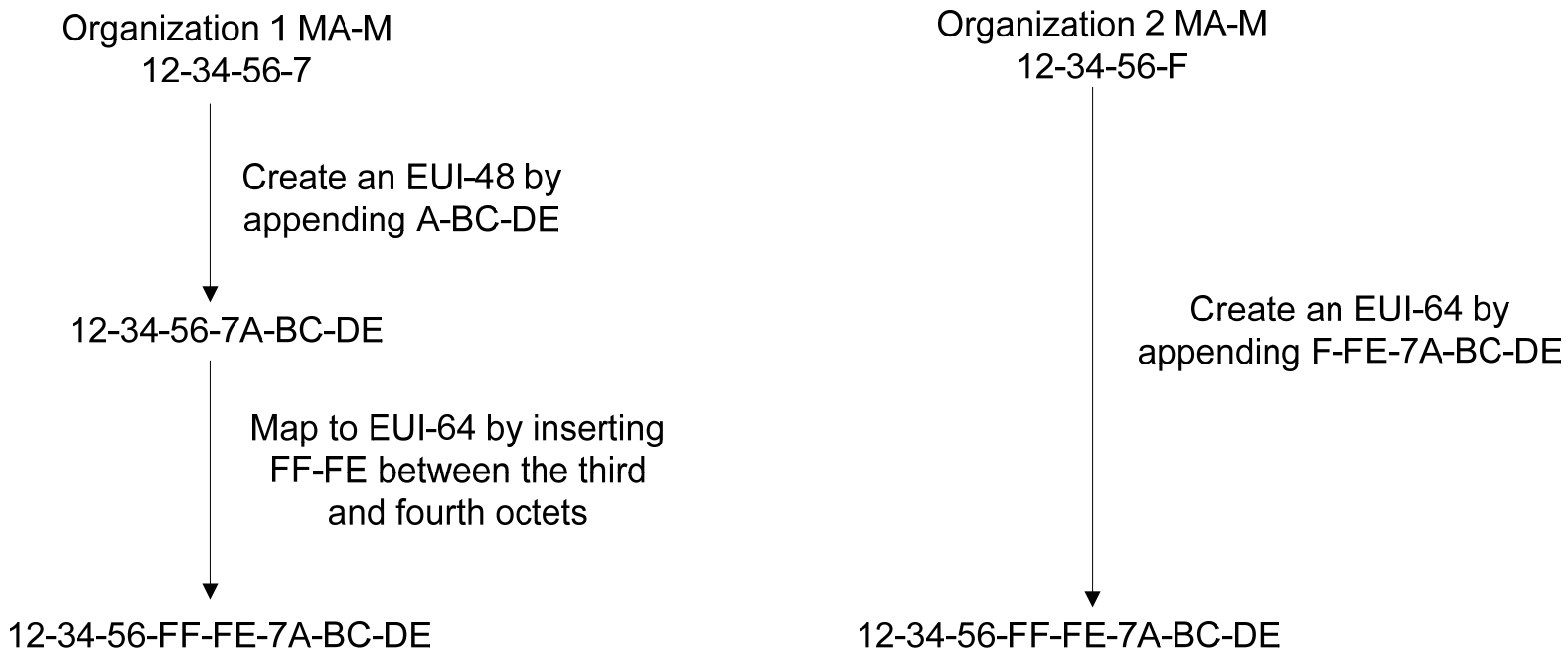
- Historically, EUI-48 was mapped to EUI-64 by inserting FF-FE between the OUI (first three octets of the EUI-48) and the extension identifier (last three octets of the EUI-48, i.e., the octets assigned by the organization with that OUI assignment)
- Historically, MAC-48 was mapped to EUI-64 by inserting FF-FF between the OUI and the extension identifier
- With the combining of the historical EUI-48 and MAC-48 uses into the current EUI-48 use, either FF-FE or FF-FF could be used for the mapping
- However, as will be seen shortly, the use of either mapping with an EUI-48 assigned with an MA-S (OUI-36) or MA-M can potentially result in the same EUI-64 (i.e., a duplicate) as one assigned with a different MA-S or MA-M
- In view of this, the IEEE RAC has deprecated this mapping
  - The mapping should not be used in new standards; however, the potential for creating duplicate EUI-64s in existing standards must still be addressed

Mapping EUI-48 to EUI-64 – 2

- MAC-48 is referenced in IEEE 1588 – 2008 in the discussion of the mapping of EUI-48 to EUI-64, for creating clockIdentities
  - IEEE 1588 – 2008 specifies that the mapping be done by inserting FF-FE; however, no mention is made of FF-FF, and mapping using FF-FF is not allowed
  - It appears that the reason for referencing MAC-48 in Note 3 (p.50) and indicating that it is deprecated is to explain why FF-FE and not FF-FF is used
  - With the combining of the historical EUI-48 and MAC-48 uses into EUI-48, it would seem that the restriction of the mapping to using FF-FE (and not FF-FF) is no longer needed
  - However, the potential for generating duplicate EUI-64s from EUI-48 assignments made from MA-S or MA-M must still be addressed, and the resolution of this issue may make the question of whether FF-FF could be used in the mapping moot
- Note that the term MAC-48 was made obsolete prior to January 1, 2014 and, in fact, prior to the publication of IEEE 1588 – 2008
- It is not clear why Note 3 of IEEE 1588 – 2008 indicates that MAC-48 is deprecated, rather than indicating it is obsolete

Examples of creation of Duplicate EUI-64s – 1

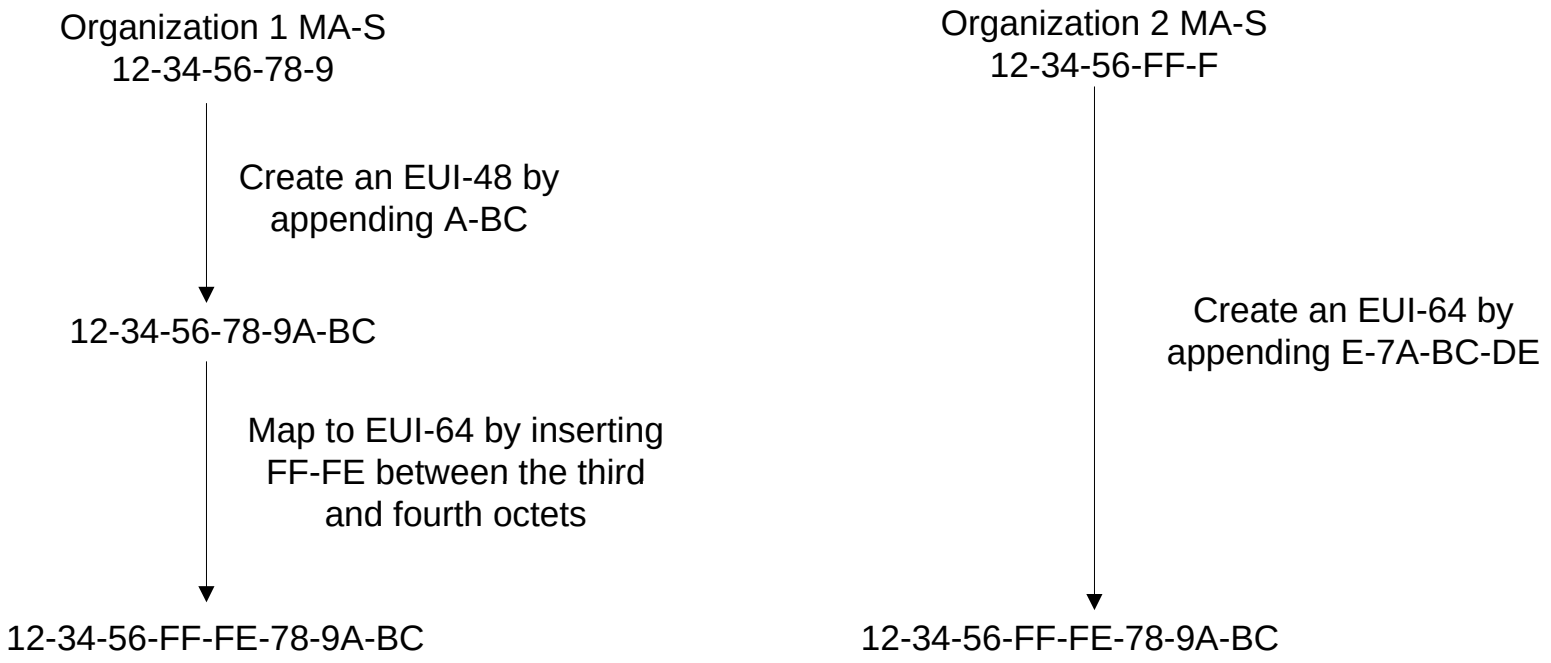
- Example 1 – EUI-48s were assigned from MA-M



- It is seen from this example that the FF-FF mapping also has he potential to create duplicates
  - In the above example, replace FF-FE by FF-FF in the mapping (organization 1) and append F-FF-7A-BC-DE in producing the OUI assignment of organization 2

Examples of creation of Duplicate EUI-64s – 2

- Example 2 – EUI-48s were assigned from MA-S



- It is seen from this example that the FF-FF mapping also has he potential to create duplicates
  - In the above example, replace FF-FE by FF-FF in the mapping (organization 1) and append F-7A-BC-DE in producing the OUI assignment of organization 2

Examples of creation of Duplicate EUI-64s – 3

- It is seen from the examples that the potential for duplicates occurs because, in mapping an EUI-48 that was assigned from an MA-M or MA-S, the mapping replaces bits assigned by IEEE with a portion of the FF-FE being inserted
  - When mapping an EUI-48 assigned from an MA-M, the last 4 bits of the MA-M assigned by IEEE are replaced by F
  - When mapping an EUI-48 assigned from an MA-S, the last 12 bits of the MA-S assigned by IEEE are replaced by FF-F

Possible Solutions to Problem of Duplicate Creation – 1

- The following are possible solutions to the problem of creation of duplicates when mapping EUI-48 to EUI-64
- These may not be the only solutions
  - They are solutions that either have occurred to or were suggested to the author
- These solutions are suggested with the goal of resolving this problem for IEEE 1588 and its profiles
  - They may be of use for other standards that already use the mapping
- All the solutions are backward compatible with respect to the PTP protocol and interoperability
  - This is because, with all the solutions, a clockIdentity is still an EUI-64
  - However, some of the solutions may not be backward compatible with existing procedures used by producers of 1588 equipment to create clockIdentities

Possible Solutions to Problem of Duplicate Creation – 2

- Solution 1 – Permanently prohibit the mapping in IEEE 1588 and its profiles
  - Going forward, clockIdentities would be formed by directly appending an extension identifier (i.e., bits) to MA-L (OUI), MA-M, or MA-S
- Potential disadvantages
  - Producers of 1588 equipment who use the mapping to create clockIdentities might have to change some of their procedures for creating the clockIdentities
  - Designs in which a clockIdentity is automatically generated by mapping the EUI-48 of one of the ports might have to change

Possible Solutions to Problem of Duplicate Creation – 3

- Solution 2 – Allow the mapping only for EUI-48s that have been assigned from MA-L (or OUIs assigned prior to January 1, 2014)
  - Prohibit the mapping for EUI-48s that have been assigned from MA-M or MA-S (or OUI-36s assigned prior to January 1, 2014)
- Potential disadvantages
  - Producers of 1588 equipment who obtain their Ethernet interfaces from other vendors would have to determine whether the EUI-48s of those interfaces were assigned from MA-L, MA-M, or MA-S
    - This is possible in principle using the public registries maintained on the IEEE RA site, but it does require an extra lookup step
  - This might require changes to designs or procedures in the case of 1588 equipment where a clockIdentity is automatically generated by mapping the EUI-48 of one of the ports
    - In these cases, it would have to be ensured that the port MAC addresses were not assigned from MA-M or MA-S
  - The RAC policy that says that first-time customers cannot purchase MA-L would have to change or, at least, exceptions would have to be granted to first-time customers that wanted to use the mapping to create clockIdentities for their 1588 equipment

Possible Solutions to Problem of Duplicate Creation – 4

- Solution 3 – The IEEE would not assign MA-M identifiers that end in F or MA-S identifiers that end in FF-F
  - From the examples on the previous slides, this would prevent the creation of duplicate EUI-64s
- Potential disadvantages
  - This would make large portions of the space of MA-Ms and MA-Ss unusable, which partly defeats one purpose of introducing the new tier structure (namely, to ensure a continued supply of available MA-Ls (OUIs), MA-Ms, and MA-Ss (OUI-36) for assigning EUI-48s and EUI-64s)
  - For MA-M, 1/7 (approximately 14%) of the assignments would not be usable
  - For MA-S, 1/3 (approximately 33%) of the assignments would not be usable

Possible Solutions to Problem of Duplicate Creation – 5

- Solution 4 – Define a new mapping, where the inserted bits do not replace bits assigned by the IEEE RA
  - For example, the inserted bits could go immediately after the IEEE-assigned bits, or at the end of the EUI-48
- Potential disadvantages
  - It appears that, since this solution changes the current mapping, it has the same disadvantages as solution 1
  - As with solution 1, producers of 1588 equipment who use the mapping to create clockIdentities might have to change some of their procedures for creating the clockIdentities
  - As with solution 1, designs in which a clockIdentity is automatically generated by mapping the EUI-48 of one of the ports might have to change

Possible Solutions to Problem of Duplicate Creation – 6

- Solution 5 – Create a new registry, separate from OUI, for IEEE 1588 uses
  - This solution was suggested to the author by [4]
  - With this solution, a user would purchase from IEEE a 24-bit assignment that could be used only for 1588 uses
    - These include the current uses described on slides 5 and 6, plus any other uses that might be added in the next edition of 1588
  - For backward compatibility, assignments that correspond to OUIs, MA-Ls, and CIDs already assigned would not be assigned to anyone else
    - This means that, effectively, the assignees of these current OUIs, MA-Ls, and CIDs would automatically be assigned the corresponding 1588 assignment
  - In addition to solving the problem of possible duplicate EUI-64s, this solution also has the advantage that 1588 assignments will not consume any CIDs, MA-Ls, MA-Ms, or MA-Ss
    - This would be advantageous if it is expected that there might be a very large number of organizations that need 1588 identifiers or need to assign clockIdentities

Possible Solutions to Problem of Duplicate Creation – 7

❑Solution 5 (Cont.)

- The following policy issues would have to be decided by IEEE (presumably by the RAC)
  - Would a purchaser of a 1588 assignment be given the option to purchase the corresponding MA-L (if this were allowed, it also means that a purchaser would have to be given a 1588 assignment for which the corresponding MA-L is available)
  - In the above case, would any of the RAC policies on purchasing MA-Ls be relaxed (e.g., if the purchaser were a first-time customer, or if 95% of an existing assignment were not yet consumed)
  - Would a purchaser of an MA-L be given the option to purchase the corresponding 1588 assignment
  - Would it be permissible for a user to generate a clockIdentity whose bits are equal to the EUI-64 that would be formed by mapping the EUI-48 of one of the ports of the 1588 equipment
  - Note that if it were decided not to allow the above, it would mean that the clockIdentities and 1588 identifier would be unrelated to any CID or MA-L (or OUI) that the organization owned, except for those organizations that obtained MA-Ls (or OUIs) or a CID prior to when this scheme would go into effect

Possible Solutions to Problem of Duplicate Creation – 8

- Potential disadvantages (of solution 5)
  - If the items under Policy Issues on the previous slide are not allowed, this solution effectively prohibits the mapping (except possibly for organizations that obtained MA-Ls (or OUIs) or a CID prior to the introduction of this scheme) and has the same disadvantages as solution 1
    - Producers of 1588 equipment who use the mapping to create clockIdentities might have to change some of their procedures for creating the clockIdentities
    - Designs in which a clockIdentity is automatically generated by mapping the EUI-48 of one of the ports might have to change
  - This solution involves creation and administration of a new registry by the IEEE RA
    - This would include, e.g., maintaining the registry on the RA website, FAQ, tutorial(s), procedure for purchasing the identifier, etc.
    - There would be cost to the user associated with this

Next Steps

- The deprecation of the EUI-48 to EUI-64 mapping is on the agenda for the July 17, 2014 RAC meeting (San Diego, 6:30pm - ??, collocated with IEEE 802 meeting)
- For now, the author would like at least informal comments on solutions 1 – 5, suggestions for additional solutions, and any other comments or suggestions

References

[1] *Guidelines for Use of Organizationally Unique Identifier (OUI) and Company ID (CID)*, IEEE Registration Authority tutorial, available at http://standards.ieee.org/develop/regauth/tut/index.html

[2] *Guidelines for 48-bit Global Identifier (EUI-48™)*, IEEE Registration Authority tutorial, available at http://standards.ieee.org/develop/regauth/tut/index.html

[3] *Guidelines for 64-bit Global Identifier (EUI-64™)*, IEEE Registration Authority tutorial, available at http://standards.ieee.org/develop/regauth/tut/index.html

[4] Conversation with John Eidson, June 18, 2014.

End of Presentation to IEEE P1588 Upkeep Subcommittee

Following are some comments and suggestions from P1588 Upkeep SC participants, during and after the presentation

Summary of comments by Upkeep SC chair, at end of call

- There must be a solution to ensure no duplication of clockIdentities. This applies given the current population of IEEE1588 devices using the existing procedures of the standard.
- Current procedures for generating clockIdentities from EUI-48 addresses cannot guarantee uniqueness when the EUI-48 is generated from a MA-M (ending in 0xF) or MA-S (ending in 0xFFF).
- There is a strong desire for a simple solution (i.e. simple algorithm, limited options, intuitive).
- There might only be 1000 vendors today who are implementing 1588 solutions. However, this is likely to change with the 'internet of things'. There is potential for the number of vendors to explode.
- IEEE 1588 is not the only organization that has this issue and RAC needs to work with all such organizations and help define a common solution.

Other comments, made during call – 1

- Could solution 3 be adapted to only apply if a user indicates that there will be a need/desire to generate clockIdentities?
  - In this case, the user would not be issued an MA-M ending in F or an MA-S ending in FF-F
  - However, if the user did not indicate a need/desire to generate clockIdentities, they could be issued an MA-M or MA-S ending in F or FF-F, respectively
  - But, it was indicated (by the presenter) in response that this could be problematic
    - Suppose the use later needed to generate clockIdentities. Would they be permitted at that point to obtain another MA-M or MA-S that was suitable (or an MA-L)? Would this be permitted even if they had not used up 95% of the EUI-48s associated with the initial MA-M or MA-S?
    - This would, in effect, create two classes of MA-S and MA-M, with one class giving the user more capabilities (i.e., the ability to create clockIdentities); should the relative cost of the MA-Ms or MA-Ss ending in F or FF-F be smaller?
- One participant indicated that he would like to retain a capability to create a clockIdentity from a MAC address, even if the mapping were different from the current mapping

Additional Solution Suggested after the Call – 1

- This is based on a suggestion by the P1588 Upkeep SC chair (via Central Desktop discussion)
- Suppose the following were done:
  - Continue to all an EUI-64 (for 1588, a clockIdentity) to be formed by appending the respective number of bits to an MA-L (OUI), MA-M, or MA-S
  - Going forward, prohibit the current mapping of EUI-48 to EUI-64
  - Reserve a block of 256 contiguous OUIs or CIDs for use for mapping EUI-48 to EUI-64, for purposes of creating identifiers (e.g., 1588 clockIdentity)
    - The 256 contiguous OUIs or CIDs would be of the form YY-YY-xx, where YY-YY are fixed hex digits and xx are any hex digits. Effectively, all OUIs or CIDs in the range YY-YY-00 through YY-YY-FF would be reserved
    - Whether this would be a block of OUIs or CIDs depends on whether the second least significant bit of the first octet YY is 0 or 1, respectively
  - An EUI-48 of the form ZZ-ZZ-ZZ-ZZ-ZZ-ZZ would be mapped to EUI-64 by appending the EUI-48 to the above hex digits YY-YY, to obtain YY-YY- ZZ-ZZ-ZZ-ZZ-ZZ-ZZ
    - This EUI-64 would not clash with any other EUI-64, because all the digits are unique (i.e., all OUIs or CIDs whose first two octets are YY-YY are reserved, and the EUI-48 ZZ-ZZ-ZZ-ZZ-ZZ-ZZ is unique

Additional Solution Suggested after the Call – 2

- It would be preferable to use a block of CIDs rather than OUIs, because the EUI-48s associated with the OUIs YY-YY-xx are not used
  - However, if this is not considered an allowable use of CIDs, the use of OUIs would allow the mapping to be used and there would be no duplicate EUI-64s assigned
- Note that this approach could be used for all current identifiers based on EUI-64 for which the identifiers are created by using the current mapping (i.e., insertion of FF-FE or FF-FF between the 3rd and 4th octets)
  - For example, this approach could be used for both 1588 clockIdentities and bluetooth system identifiers
    - at present, there is no need for these two identifier to be unique relative to each other; but, if there were such a need, the organization creating the identifiers from their MA-L, MA-M, or MA-S would still have to ensure there was no overlap, whether or not they were using the current or proposed mapping
  - This means that IEEE would need to reserve only a single block of 256 OUIs or CIDs

Additional Solution Suggested after the Call – 3

- For other uses of OUI in IEEE 1588, the current approach would continue to be used, i.e., these would be formed from an OUI or CID owned by the respective organization; the other uses are
  - profileIdentifier
  - Manufacturer identity in CLOCK_DESCRIPTION management TLV
- As a final item, not related to the mapping from EUI-48 to EUI-64, IEEE 1588 defines non-EUI-64 clockIdentities, for use by organizations using 1588 but not with IEEE 802 protocols
  - Examples are ControlNet, DeviceNet, and Profinet (described in IEEE 1588 transport-specific annexes)
  - At present, these uses are defined in 7.5.2.2.3 of IEEE 1588 – 2008
  - Any new uses have to be added to IEEE 1588, and require a revision or amendment
  - But, it seems that whether or not IEEE 802 protocols are used, the clockIdentity can be based on EUI-64, and the profileIdentifier and CLOCK_DESCRIPTION management TLV can be based on OUI or CID
  - Therefore, it seems that, at least in principle, the current scheme of identifiers for systems not using IEEE 802 protocols for transport is not essential in the future