Applying 802.1p

Norman Finn, Cisco

Gideon Prat, Intel

John Wakerly, FORE

Outline of Choices

1. **Endstation limited to one class of service for unicast frames.**
2. **Endstation may receive unicast frames on different CoSs.**
   - **2.1 MAC addresses with no algorithmic relationship.**
     - **2.1.1 Single L3 address, multiple MAC addresses.**
     - **2.1.2 Multiple L3 addresses, one MAC address per L3 address.**
   - **2.2 MAC addresses with an algorithmic relationship.**
     - ***2.2.1 Assign blocks of locally-administered MAC addresses.**
     - **2.2.2 Assign blocks of universally-administered MAC addresses.**
       - ***2.2.2.1 The 22 bits of the OUI.**
       - **2.2.2.2 The I/G bit.**
       - **2.2.2.3 The 24 vendor-assigned bits.**
     - ***2.2.3 Assign mixture of universally- and locally-administered MAC addresses, i.e. redefine the U/L bit.**

CHOICE A:

1. **An endstation is limited to a single class of service for unicast frames.**
2. **An endstation may receive frames on different classes of service for unicast frames.**

Choice 1 is clearly not an acceptable limitation on the applications that wish to use CoS, which forces us to select choice 2.

CHOICE B:

2.1 Use MAC addresses with no algorithmic relationship (e.g. 0134.5600.5432 and 0134.5600.8441)

2.2 Use MAC addresses with an algorithmic relationship, said algorithm being well-known to all bridges, switches, and endstations (e.g. differ by one or a few bits in a standard place).

Choice 2.1:

CON:

1. **Most existing endstations have only a single globally-administered MAC address each. In order to gain multiple MAC addresses, locally-administered addresses could be used. However, no protocol has been proposed, and no standard mechanism exists in the existing Ethernet world, to assign these addresses.**
2. **The address storage and maintenance requirements on bridges and switches are increased dramatically as stations begin registering up to 8 addresses each.**

Choice 2.1 CON (cont'd):

3. **The protocol overhead required to register the endstations' MAC addresses is burdensome, and if VLANs are employed and the number of endstations greatly increased, this overhead becomes unacceptable.**
4. **Many endstations with older 802.3 MAC interfaces support only a single MAC address. In order to accept multiple MAC addresses, the interface must be placed in promiscuous mode, placing a significant burden on the endstation to filter unwanted unicast traffic in software.**

Although these objections are weighty in total, all can be corrected or ignored. Choice 2.1 has not yet been eliminated from consideration.

CHOICE C:

2.1.1 Use a single L3 address for an endstation, with multiple MAC addresses.

2.1.2 Use multiple L3 addresses for an endstation, corresponding to the different CoS levels desired, with one MAC address per L3 address.

Neither of these choices is at all practical. The higher layers are not going to make the fundamental changes required to support choice 2.1. Thus, choice B must be made in favor of 2.2 - an algorithmic mapping between the multiple MAC addresses.

CONVERTING MAC ADDRESS BITS TO COS INDICATORS

- **The endstation can retain a single name, single L3 address, and for all purposes except making the choice of CoS, a single MAC address.**
- **We can dispense entirely with explicit unicast registrations.**
- **“Algorithmic mapping” is merely the dedication of one (or more) address bits to CoS selection.**

CHOICE D:

2.2.1 Assign each endstation a set of locally-administered MAC addresses, one for each level of CoS supported. Since the addresses are administered locally, any division of the 46 available bits (48 less I/G and U/L bits) between endstation identification and priority indication is possible.

2.2.2 Assign each endstation a set of globally-administered MAC addresses, with a standardized division of the 46 available bits between endstation identification and priority.

2.2.3 Assign each station a mixture of globally- and locally-administered MAC addresses, with a standardized division of the 47 available bits between endstation identification and priority. (Mixing global and local MAC addresses makes the U/L bit available.)

ALL MAC ADDRESSES LOCALLY ADMINISTERED

Choice 2.2.1 is a definite possibility, but it raises the question of how to assign the locally-administered MAC addresses to the workstations. A number of techniques can be imagined that would work. At this time, however, no interoperable (i.e. standard) solution exists, and the problem is clearly non-trivial.

CONVERT GLOBAL MAC ADDRESS BITS TO COS INDICATORS

CHOICE E:

2.2.2.1 The 22 bits of the OUI.

2.2.2.2 The I/G bit.

2.2.2.3 The 24 vendor-assigned bits.

- **2.2.2.1 cuts the available number of OUIs from 4M to 2M, or less, if more than 2 levels of CoS are desired, and affects other media besides 802.3 media, which has the problem.)**
- **Choice 2.2.2.2 can be dismissed, because the I/G bit carries critical semantic meaning.**
- **Choice 2.2.2.3 can be dismissed, as a number of vendors have exhausted more than one OUI.**

CONVERTING THE U/L BIT TO A COS INDICATION

- **Choice 2.2.3 prevents CoS from being used by existing protocols that depend on the current definition of the U/L bit, such as DECNet Phase IV.**

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SUMMARY

Choice 2.2.1 - Eliminate global in favor of local MAC addresses.

- **—This requires the creation of a local MAC address assignment protocol before interoperability can be achieved.**

Choice 2.2.2.1 - Convert one OUI bit to a priority indication.

- **—This cuts the number of available OUIs in half, adversely impacting all 802 media, as well as FDDI**
- **—This clearly requires explicit action by 802 before it can be used interoperably.**

Choice 2.2.3 - Convert the U/L bit to a priority indication.

- **—This redefinition significantly impacts old endstations that support only a single MAC address**
- **—This redefinition impacts existing protocols which utilize locally-administered MAC addresses.**
- **—No additional work by 802.1 required to achieve interoperability.**

BOTTOM LINE

- **The net effect of 802.1p/D3 is to alter the meaning of the U/L bit to a Class of Service indication.**

- **Such a redefinition demands considerably more discussion than it has received to date within 802.1.**