# Solutions for P802.1Qbz / P802.11ak: Station subset issue

Norman Finn
January, 2013

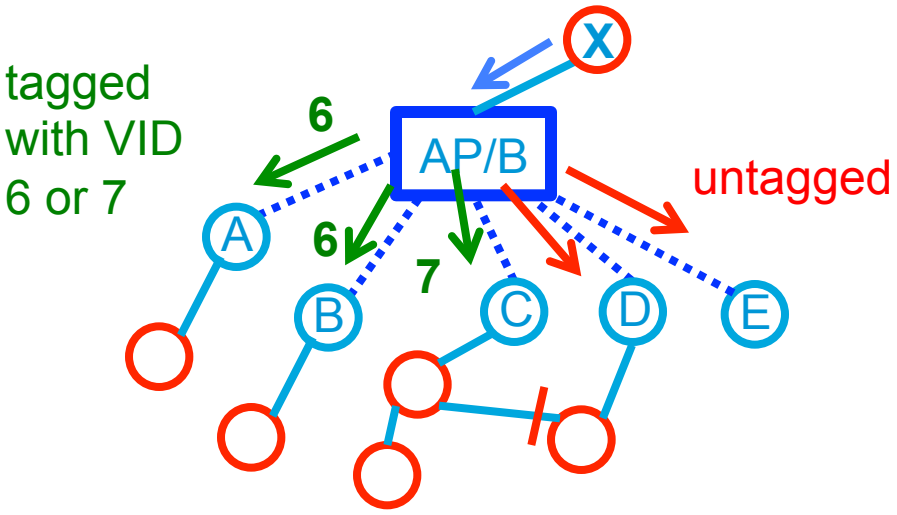
Version 1

# Introduction

- This presentation is available at: http://www.ieee802.org/1/files/public/docs2012/bz-nfinn-soln-station-subset-0113-v01.pdf
- It attempts to answer one of the questions raised by: http://www.ieee802.org/1/files/public/docs2012/bz-nfinn-pt-to-pt-problem-list-1112-v02.pdf

# Station subset problem

- AP sends the “same” multicast from X to stations behind station/ bridges A through E.
- But, tagging differences and VLAN translations result in three different resultant frames, and at least three transmissions: VID 6 (A and B), VID 7 (C), and untagged (D and E).
- How do we send each one to the right subset of stations?



# Alternative 1:
# Four address format

# Alternative 1: Four address format

- 802.11 defines four addresses for every frame:
  - **Receiver** Address: Which station(s) (AP or non-AP) should receive frame.
  - **Destination** Address: Destination address in original MAC service request.
  - **Source** Address: Source address in original MAC service request.
  - **Transmitter** Address: Which station (AP or non-AP) that transmitted frame.
- Typically, AP and non-AP stations use only three addresses per frame, by using formats that combine two addresses into a single 6-byte field:
  - UP TO AP: Receiver (the AP), Destination, Source = Transmitter (non-AP).
  - FROM AP: Receiver = Destination (non-AP), Source, Transmitter (the AP).
  - Which, of course, is the root of the “reflection” problem.

# Just use all four addresses!

- **If you simply use all four addresses for exactly the purpose described in 802.11, this problem can be solved.**
- The key is the definition of the Receiver address:
  - **Receiver** Address: Which station(s) should receive frame,
- And to notice that the Receiver Address can be a **multicast address**.
- Each non-AP (or AP) station attached to the transmitting AP "subscribes to" (accepts frames containing) some multicast Receiver Addresses (the right ones) and discards frames with other multicast Receiver Addresses (the wrong ones).

# Alternative 2: 802.11n-2009 A-MSDU

# IEEE Std 802.11n-2009 A-MSDU

- The A-MSDU described in 802.11n is a three-address frame (on the outside) that carries any number of encapsulated frames.
- The encapsulated data frames' Destination and Source addresses are internal to the frame, and not used in the outer three address fields.
- The outer Source/Transmitter address can be used by a transmitting non-AP station bridge to discard reflections, using the Source address of the reflected frame, in exactly the same way it discards them, now.
- The outer Destination and Receiver addresses are always the AP/ Bridge on frames sent towards the AP, and the Destination/ Receiver address on frames sent by the AP is a multicast address denoting some subset of the non-AP stations.

# Both alternatives

# For either alternative, 2 issues to settle:

- The AP and its attached stations have to agree on what to use for the multicast Receiver (four-address alternative) or Receiver/ Destination (A-MSDU alternative) addresses.
- We have to make sure that existing non-AP stations will not do the wrong thing when they receive frames containing multicast Receiver addresses that are not the broadcast address.

# Receiver multicast addresses

- There is a protocol described in IEEE Std 802.1BR for distributing a mapping between multicast MAC addresses and a list of delivery ports (e.g. for non-AP stations S1, S2, …):

| MAC address | S1 | S2 | S3 | S4 | S5 | S6 | S7 | … |
|---|---|---|---|---|---|---|---|---|
| 01-80-C2-XX-00-01 | Y | Y | N | N | Y | N | Y | … |
| 01-80-C2-XX-00-05 | Y | Y | Y | N | Y | Y | Y | … |
| 01-80-C2-XX-00-12 | N | N | N | Y | Y | N | N | … |
| … | … | … | … | … | … | … | … | … |

- Distributing the vectors has problems with delays that are similar to the delay problems when distributing MAC address mappings in the proposal by Zhuang and Wang (document 12-1449).
- These problems can be minimized by suitable rules regarding what kinds of changes can be made to the vector list.

# Old non-AP stations

- One easy solution, very similar to what is often done, today:
- Non-AP stations that expect frames without a VLAN tag, and that do not understand multicast Receiver addresses, use different SSIDs, one per VLAN.
- Non-AP stations that understand VLAN tags, but do not understand the new multicast Receiver addresses, can all go on one SSID, different from the above (but could use the above SSIDs.
- New non-AP stations that understand multicast Receiver addresses, whether bridges or not, must go on one SSID, different from all of the above.
- Some day, when all stations understand multicast Receiver addresses, only the last SSID is needed.

# Details: vector distribution rules

# Multicast vector distribution rules

- The AP generates and maintains a list of addresses and distribution vectors as shown in the table, above.
- Each non-AP station maintains only a vector with one bit per multicast Receiver address (they are all in a relatively small range), stating whether that station accepts frames with that address, or not. Bits for unknown addresses are 0. It does not bother to remember the vectors.
- When a vector is created, changed, or deleted, the AP sends messages to update the stations as necessary, and retransmits as necessary, until all notified stations have acknowledged the update.
- A vector can be used by the AP before the acknowledgements are received (or even before the notifications are sent), due to these rules:
  - A station can be added, but never removed, from an existing address's vector.
  - A vector can be deleted, and after all ACKs are received, the address can be redefined with any value.
- With these rules, when the vectors change, extra frames will likely be discarded, but none will be relayed when they should not be.