“Transparent” Bridge Discovery

IEEE 802.1 AVB WG
Singapore, Mar 2011

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The Goal

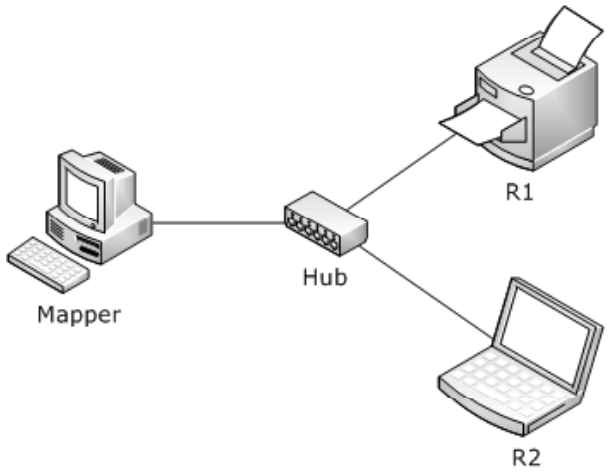
- Augmenting the way AVB discovers transparent bridge by adding other method(s) that the sole current .AS measured pDelay threshold for copper 802.3 links

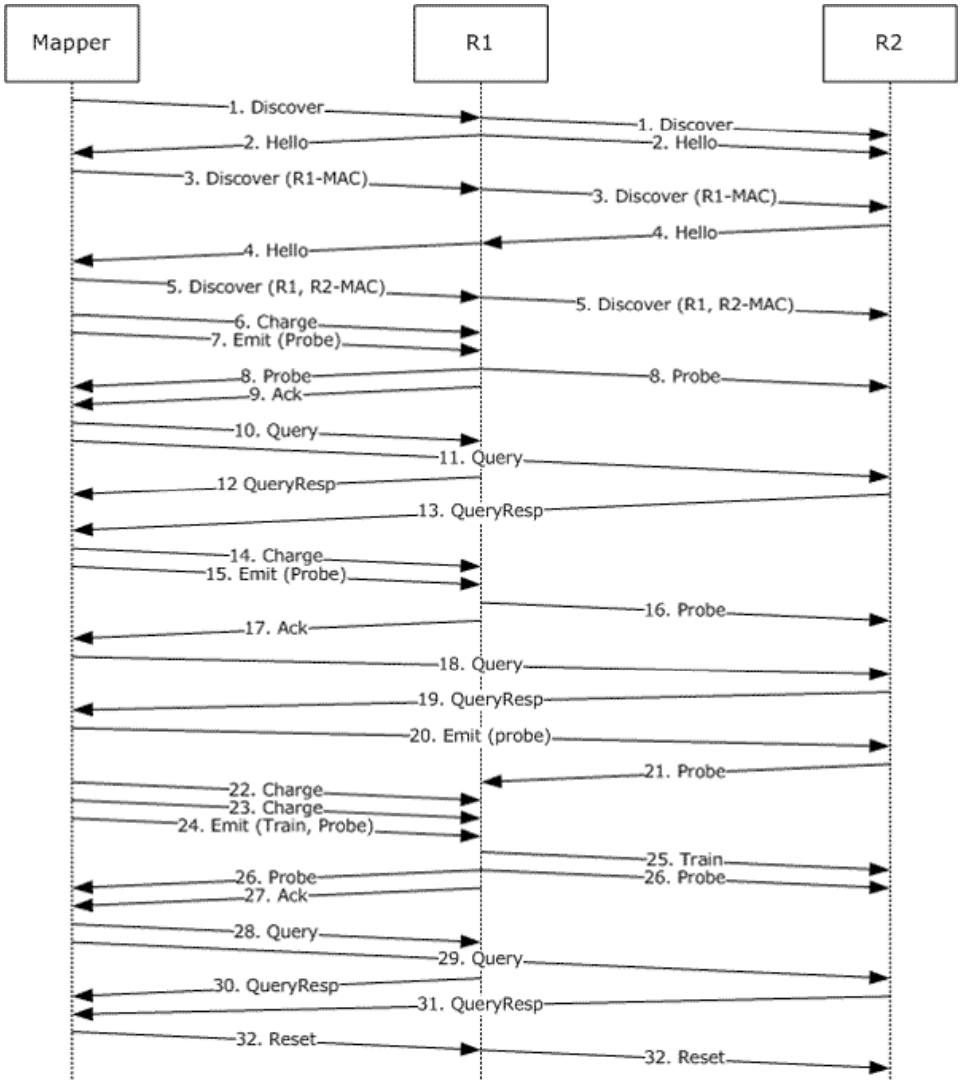
The way Microsoft's LLTD addresses it

- [MS-LLTD]: Link Layer Topology Discovery (LLTD) Protocol Specification, August 30, 2010: http://www.microsoft.com/whdc/connect/rally/lltd-spec.mspx

- "After quick discovery, the mapper knows of available responders and the types of networks they are connected to (such as Ethernet or 802.11 wireless). If the application or higher-layer protocol sees two responders on Ethernet, it could direct the LLTD Protocol to request a responder to send Ethernet frames on the wire by using different source and destination MAC addresses and ask the other responder which of the Ethernet frames it received. The MAC addresses used are dedicated for use by LLTD."

Example of MS's LLTD protocol exchange between networked mapper and two responders (1/3)





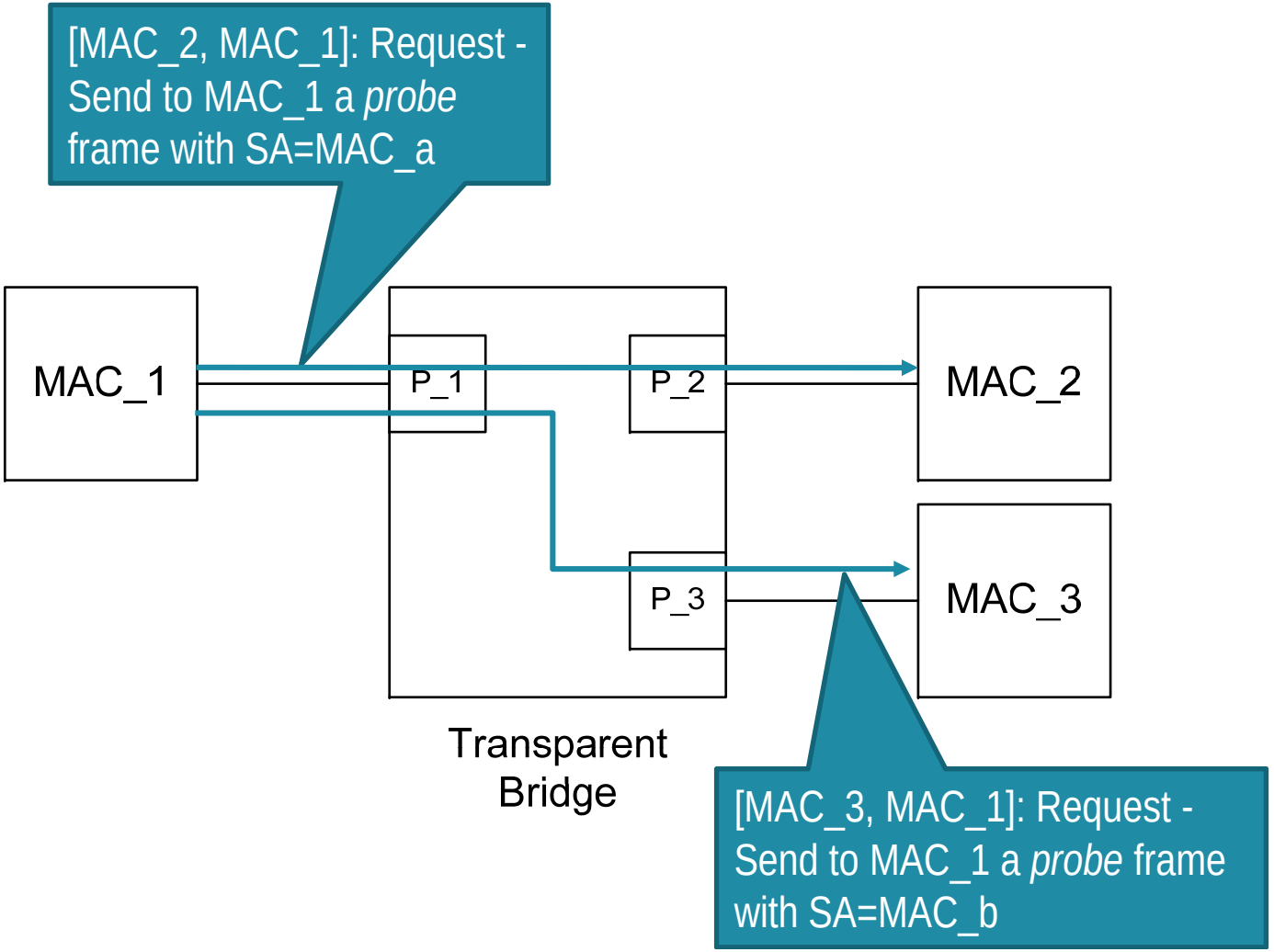
Example of MS's LLTD protocol exchange between networked mapper and two responders (2/3)

1. The Mapper broadcasts a Discover frame with a Generation Number of zero to determine what responders are available on the network.
2. Responder 1 (R1) broadcasts a Hello frame that indicates its current Generation Number and basic information, such as Host ID, Characteristics, and Physical Medium (Ethernet in this case) in its TLV_List.
3. The Mapper broadcasts another Discover frame with the generation number given by R1, including R1's responder in the Station List.
4. Responder 2 (R2) broadcasts a Hello frame that indicates its current Generation Number of zero, and basic information, such as Host ID, Characteristics, and Physical Medium (Ethernet in this case) in its TLV_List. (Note R2 used its RepeatBAND load control mechanism (section 3.5.6.2) to not respond to the first Discover with a Hello response.)
5. The Mapper broadcasts another Discover frame with the generation number given by R1, including R2's MAC address in the Station List.
6. The application now invokes LLTD with a series of tests for R1. to test the network topology. The LLTD Mapper sends a Charge frame to R1 to generate sufficient byte and frame credits in R1 for a request that will follow.
7. The Mapper sends an Emit frame to R1, indicating that R1 is to send a Probe frame with a Source MAC Address of 00-0D-3A-D7-F2-01 and a Destination MAC Address of 00-0D-3A-D7-F1-41.
8. R1 transmits the Probe frame.(Note The Destination MAC Address does not address any machine in particular, so it traverses the network like a broadcast address.)
9. R1 sends an Ack frame to the Mapper to indicate that it has completed the Emit request. At this point, the Mapper indicates to the application that the series of tests has completed.
10. The application asks LLTD to send a Query to R1 to get the list of MAC address seen by this responder.
11. The application also asks LLTD to send a Query to R2 to get the list of MAC address that this responder has seen.
12. R1 sends a QueryResp to the Mapper with no MAC address in the list, and the Mapper completes the application's request from step 10.
13. R2 sends a QueryResp to the Mapper with an entry that indicates it saw a frame with a Source MAC Address of 00-0D-3A-D7-F2-01 and a Destination MAC Address of 00-0D-3A-D7-F1-41. The Mapper completes the application's request from step 11.
14. The application decides to conduct another test and gives LLTD another set of commands for R1. The Mapper sends a Charge frame to R1 to generate sufficient byte and frame credits in R1 for a request that will follow.
15. The Mapper sends an Emit frame to R1, indicating that R1 is to send a Probe frame with a Source MAC Address of 00-0D-3A-D7-F2-02 and R2's Destination MAC Address.
16. R1 sends a Probe frame destined to R2 with a Source MAC Address of 00-0D-3A-D7-F2-02.
17. R1 sends an Ack frame to the Mapper to indicate it has completed the Emit request. At this point, the Mapper indicates to the application that the latest test has completed.

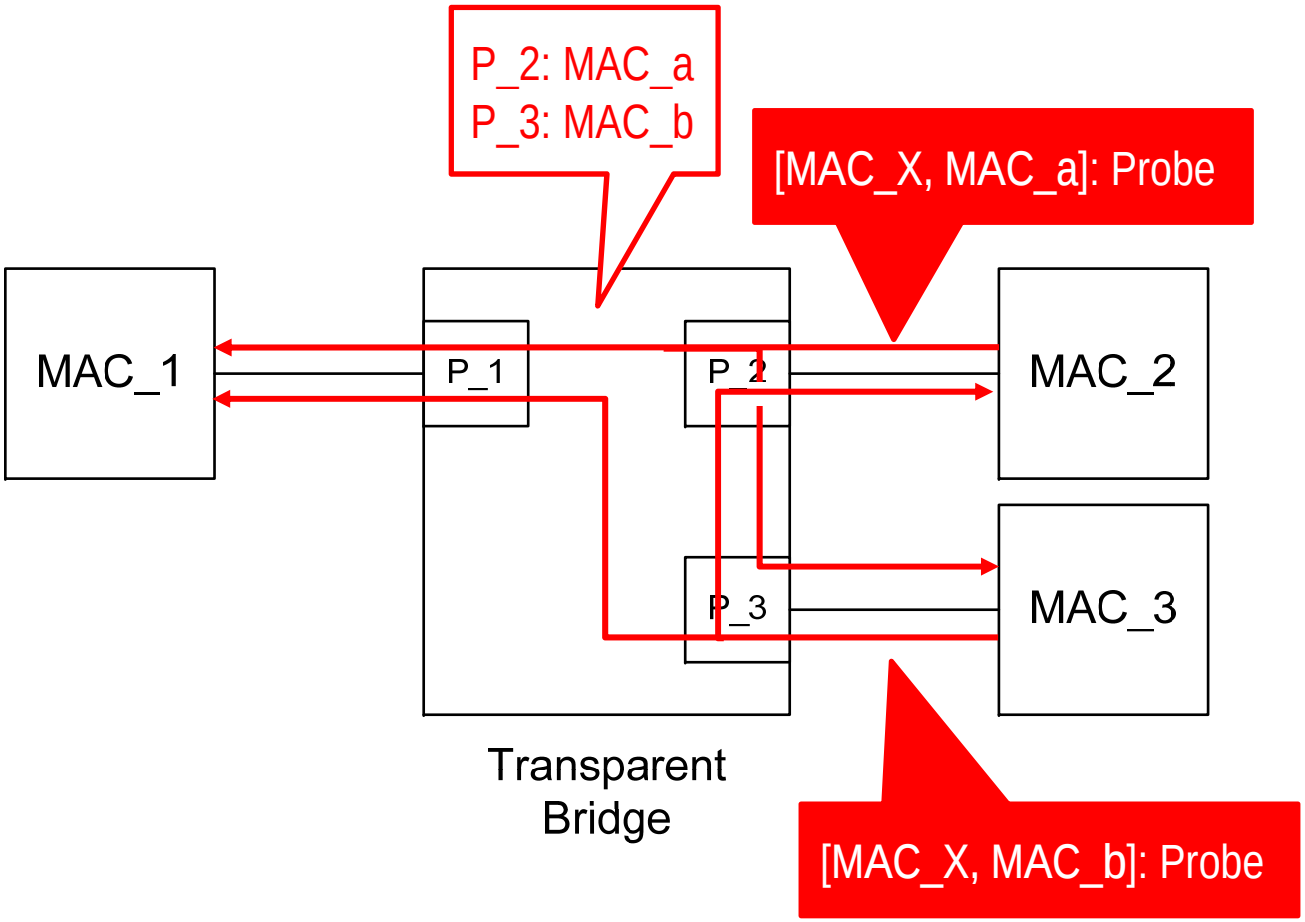
Example of MS's LLTD protocol exchange between networked mapper and two responders (3/3)

18. The application asks LLTD to send a Query to R2 to get the list of MAC addresses that this responder has seen.
19. R2 sends a QueryResp to the Mapper with an entry that indicates that it saw a frame with a Source MAC Address of 00-0D-3A-D7-F2-02 and a R2's MAC address as the destination. LLTD indicates this information to the application.(Note R2 did not return the MAC address pair that it reported in step 13 because after sending that information in step 13, it cleared that information from memory.)
20. The application asks LLTD to perform another test from R2, and the Mapper sends an Emit to R2 with a Sequence Number of zero and a request for R2 to send a Probe using R2's MAC address for the source and R1's MAC address for the destination.(Note A zero sequence number indicates to R2 that it does not send an Ack frame to the Mapper when it has completed the Emit request. Hence, the Mapper completes the application's request immediately.)
21. R2 sends a Probe using R2's MAC address for the source and R1's MAC address for the destination.
22. The application asks LLTD to perform another test from R1, and the Mapper sends a Charge frame to R1 to generate sufficient byte and frame credits in R1 for a request that will follow.
23. The Mapper sends a second Charge frame to R1 to generate sufficient byte and frame credits in R1 for a request that will follow.
24. The Mapper sends an Emit frame to R1 that requests R1 to send a Train frame using a Source MAC Address of 00-0D-3A-D7-F2-03 and R2's MAC address as the destination. The Mapper also sends a Probe frame using R1's MAC address as the Source and 00-0D-3A-D7-F2-03 as the Destination MAC Address.
25. R1 sends a Train frame using a Source MAC Address of 00-0D-3A-D7-F2-03 and R2's MAC address as the destination.
26. R1 sends a Probe using R1's MAC address for the Source and 00-0D-3A-D7-F2-03 as the Destination MAC Address.
27. R1 sends an Ack frame to the Mapper to indicate that it has completed the Emit request, and the Mapper completes the application's request from step 22.
28. The application asks LLTD to send a Query to R1 to get the list of MAC addresses that this responder has seen.
29. The application also asks LLTD to send a Query to R2 to get the list of MAC addresses that this responder has seen.
30. R1 sends a QueryResp to the Mapper with an entry that indicates that it saw a frame with R2's MAC address as the Source MAC address and R1's MAC address as the Destination MAC address. The Mapper completes the application's request from step 28.
31. R2 sends a QueryResp to the Mapper with an entry that indicates it saw a frame with R1's MAC address as the Source MAC Address and Destination MAC Address of 00-0D-3A-D7-F2-03. The Mapper completes the application's request from step 29.
32. The application finally directs LLTD to terminate the topology discovery session, and the Mapper broadcasts a Reset to indicate that the mapping session is complete.

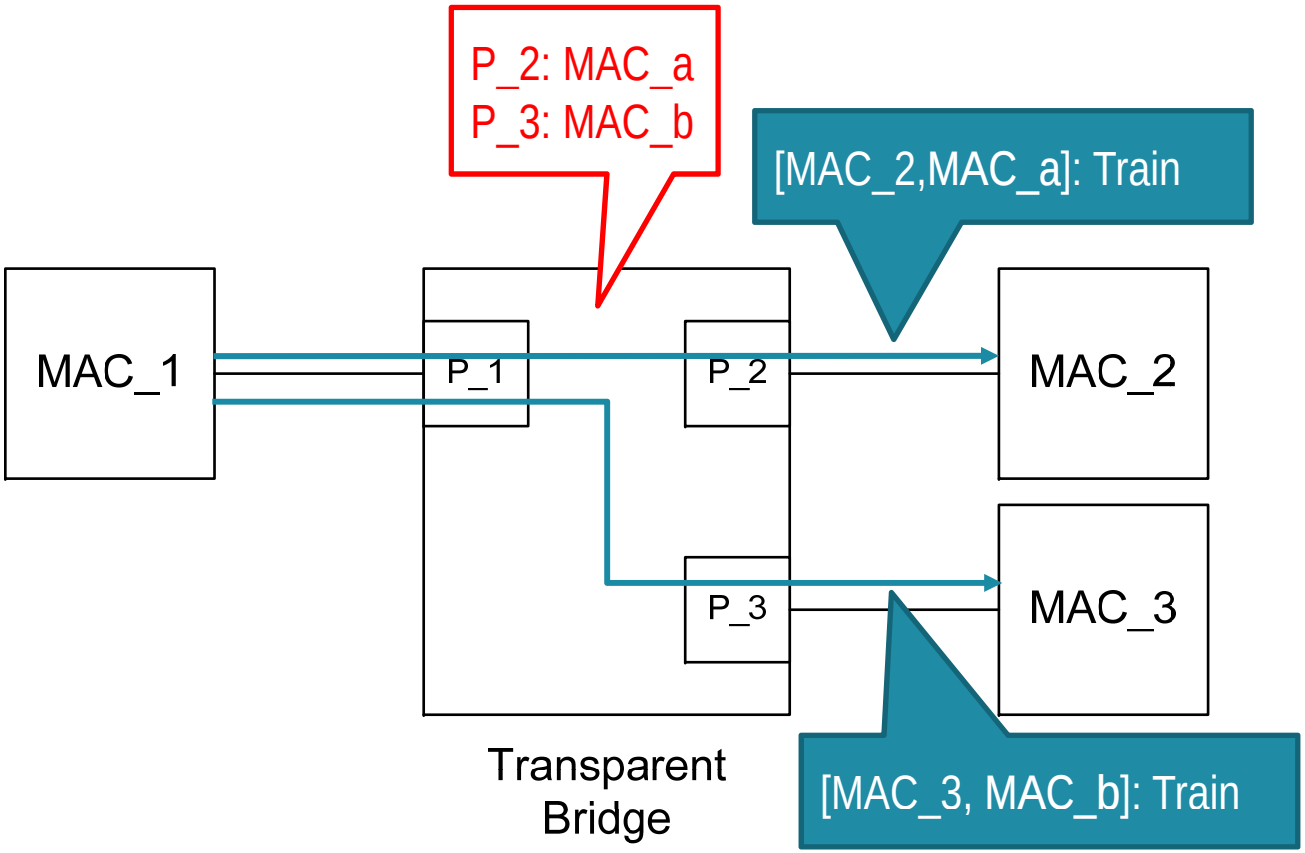
Address “manipulation” & Bridge “teaching” (1/5)



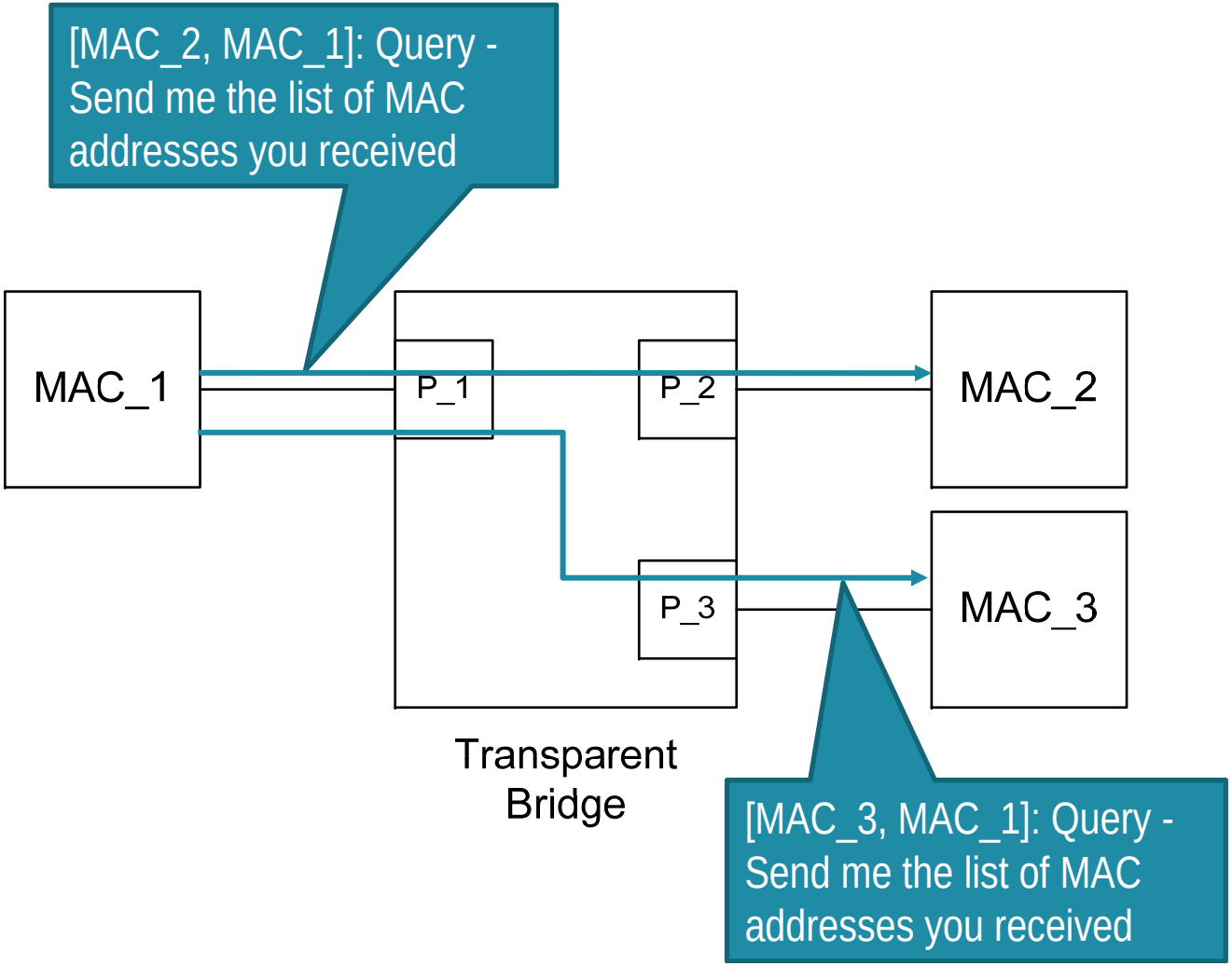
Address “manipulation” & Bridge “teaching” (2/5)



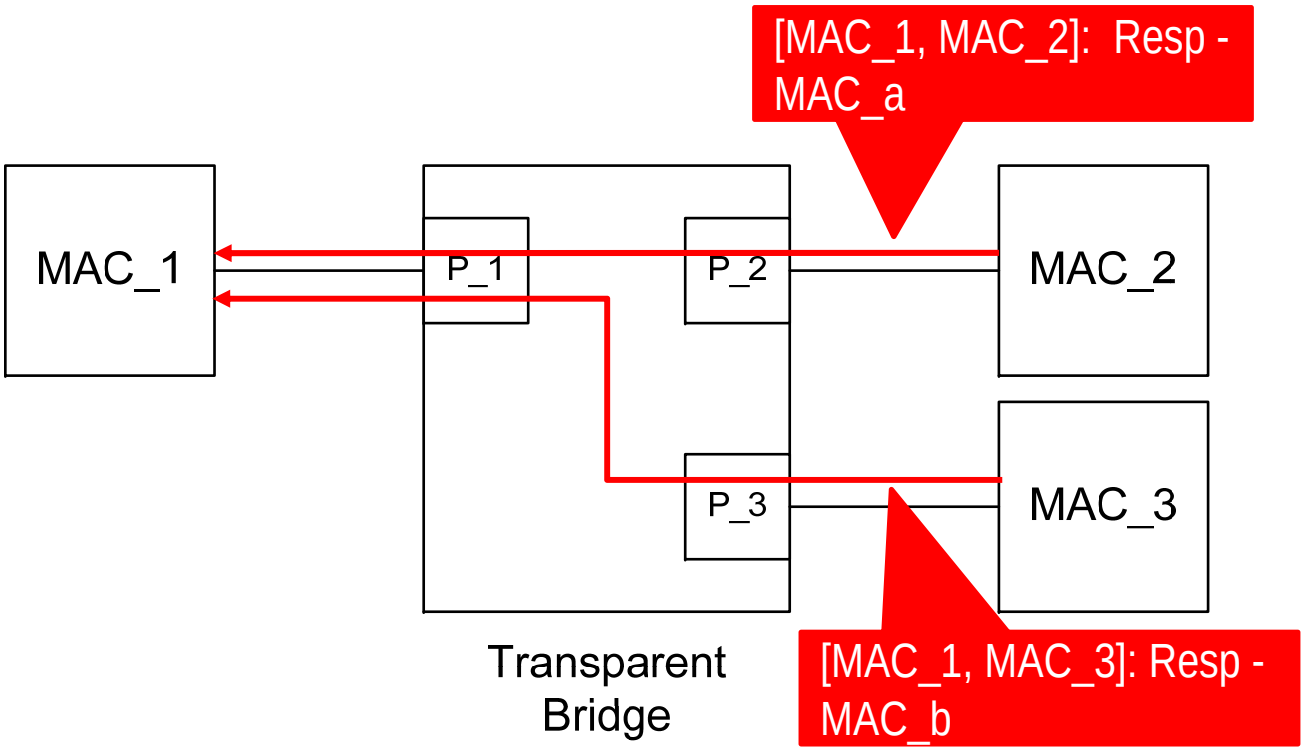
Address “manipulation” & Bridge “teaching” (3/5)



Address “manipulation” & Bridge “teaching” (4/5)



Address “manipulation” & Bridge “teaching” (5/5)



Discussion

- Can we “adapt” the idea of “address manipulation” and “bridge teaching” to discover transparent bridges in AVB ?
- Is the “address manipulation” acceptable in IEEE 802 standards ?
- Could a two_port bridge or TPRM be discovered ?