802.11 BSS Bridging

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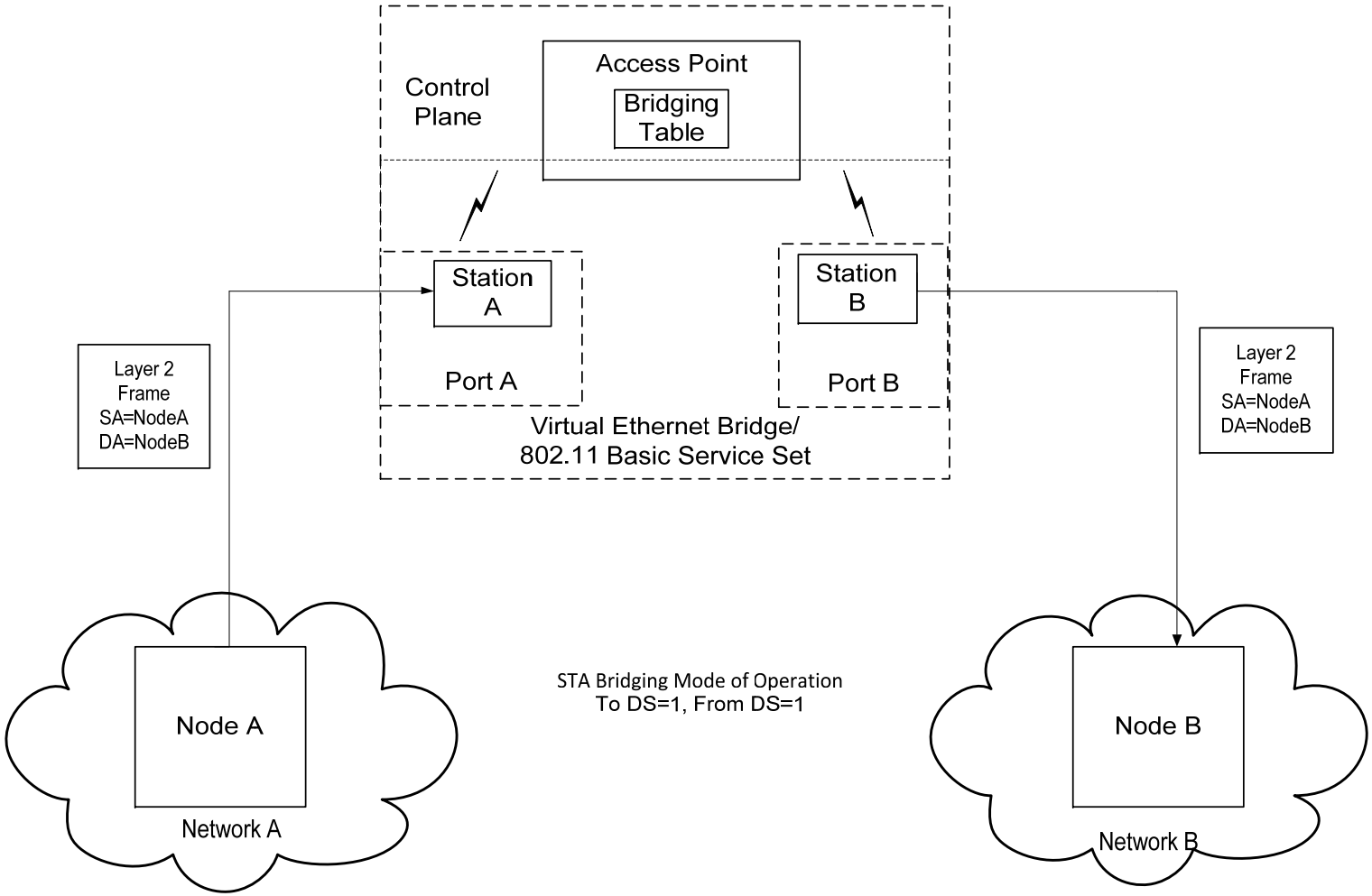
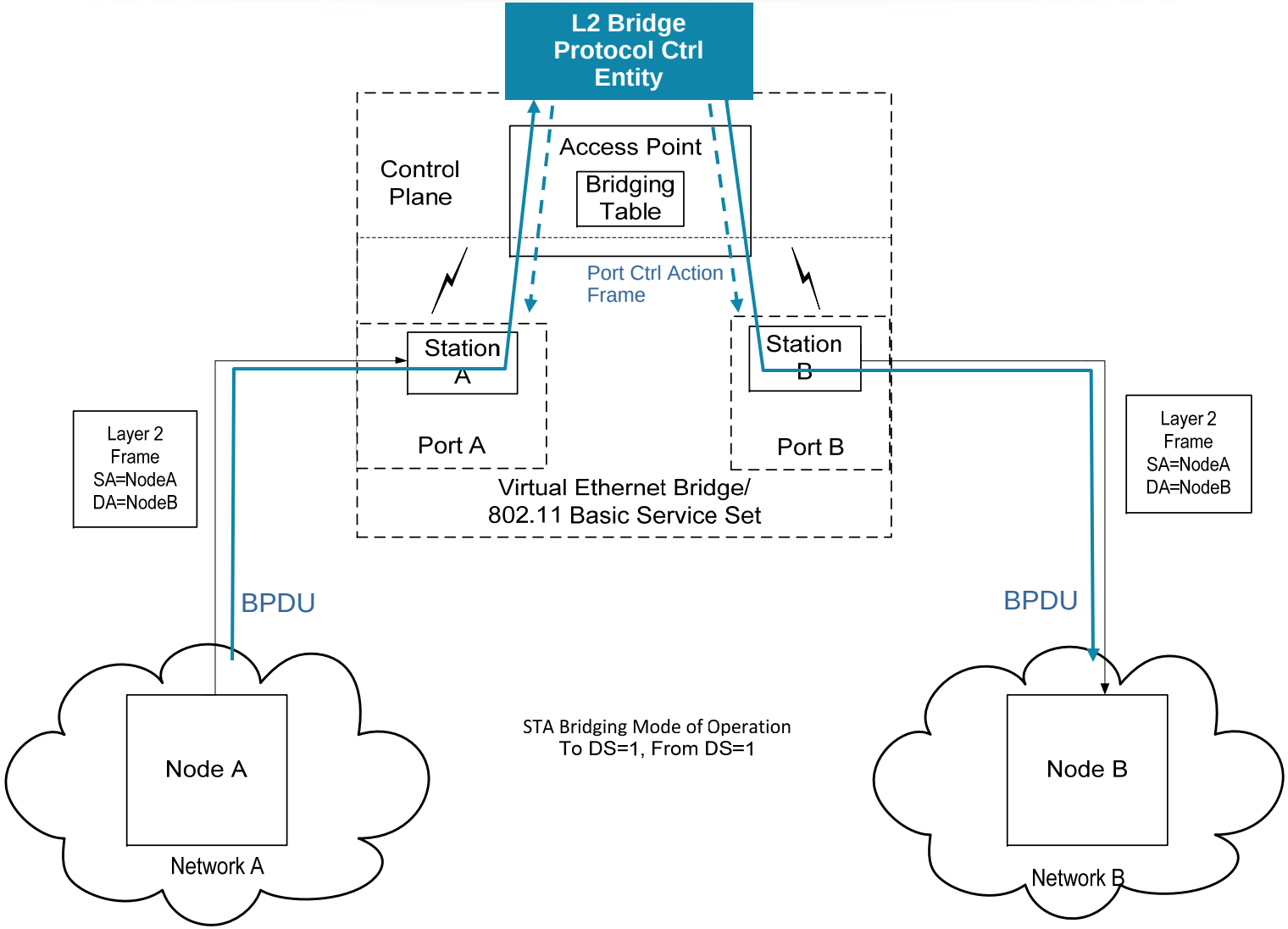
The issue

- 802.11 STA devices are end devices that do **not** bridge to external networks. This:
  - limit the topology of 802.11 BSS to “stub networks”
  - do not allow a (STA-)AP-STA wireless link to be used as a connecting path (backbone) between other networks
- Partial solutions exist to overcome this lack of bridging functionality but these solutions are:
  - proprietary only
  - limited to certain type of traffic
  - or/and based on Layer 3 (such IP Multicast to MAC Multicast translation, NAT - Network Address Translation)

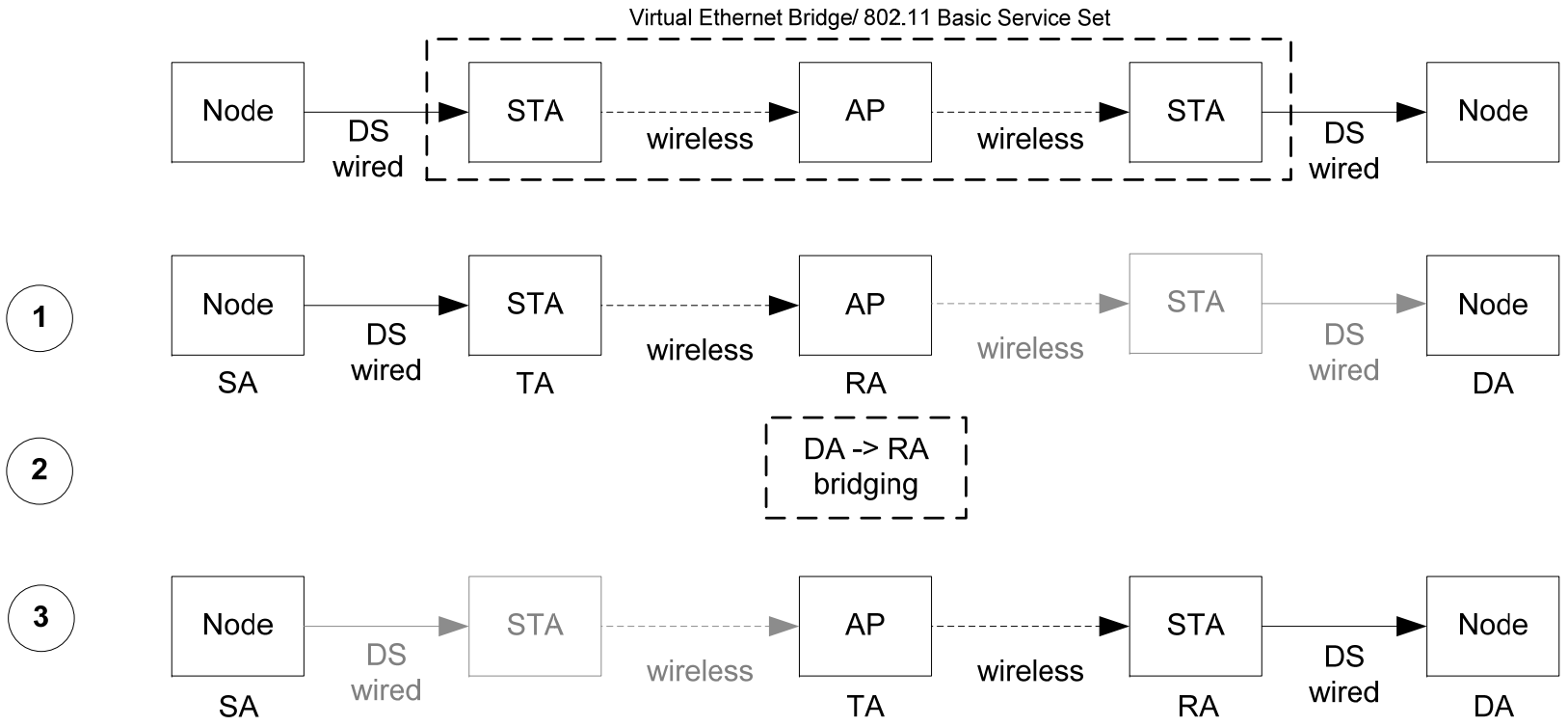
BSS Bridging Model



BSS Bridging Model (Single Ctrl Plane)



New AP Bridging Traffic Type

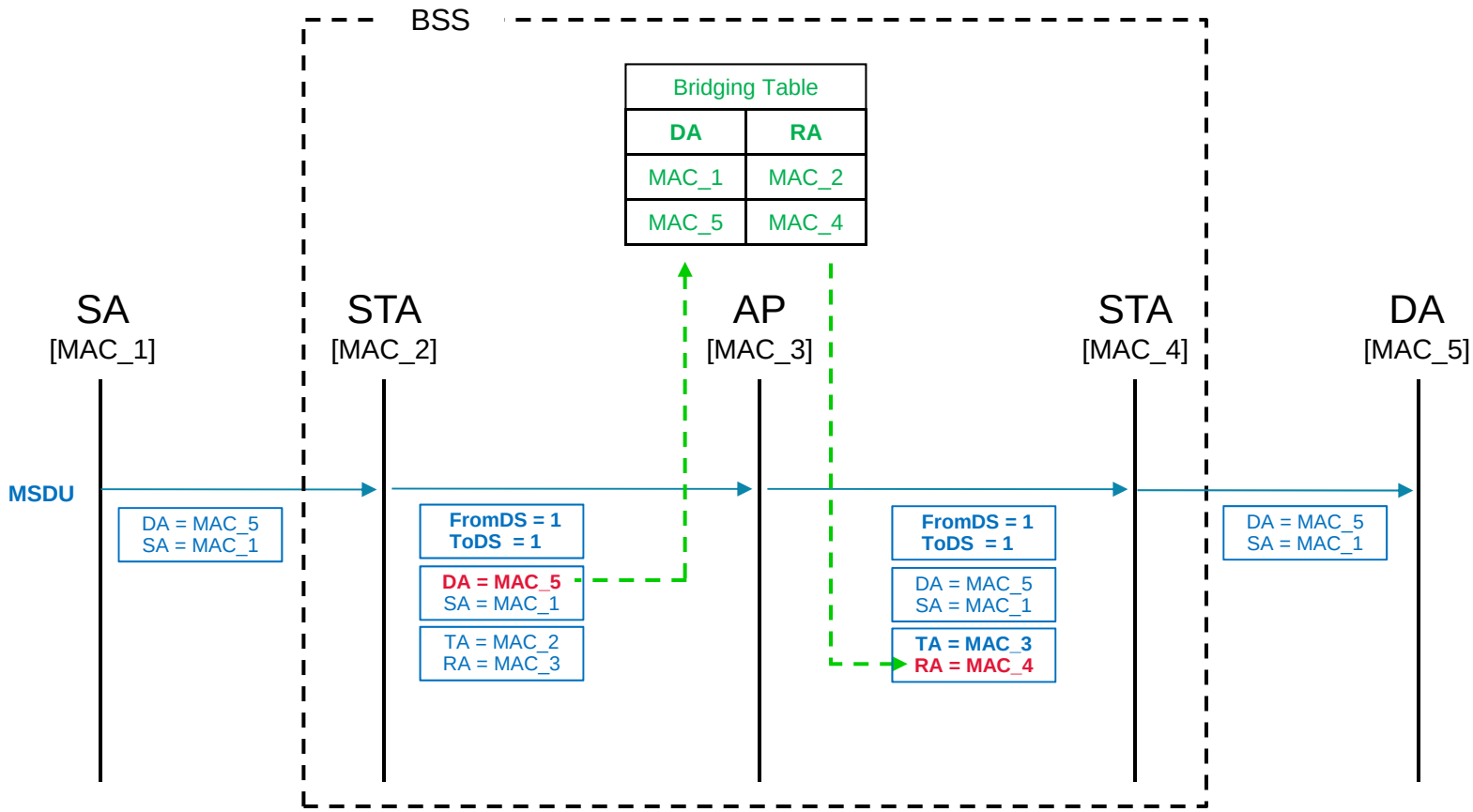


BSS Bridging

- The whole BSS is modeled as a distributed bridge overlaying the 802.11 protocol
  - AP acts as the Bridge's Control Plane
  - STAs act as Bridge Ports

- Modifications to 802.11 are limited to:
  1. [ToDS=Set , FromDS=Set] mode behavior redefined at ingress AP and ingress STAs
  2. Broadcast "Echo Cancellation" Method <TBD>
     Could be:
     - APs broadcast MSDUs without modifying the Sequence Number & STAs filter out broadcasted MSDUs they originated on SN matches
     - STAs filter out broadcasted MSDUs they originated on TID matches
  3. Additional Parameters to MLME-DLS primitives

AP Bridging


BSS
Bridging Table
DA
RA
MAC_1
MAC_2
MAC_5
MAC_4
SA
[MAC_1]
STA
[MAC_2]
AP
[MAC_3]
STA
[MAC_4]
DA
[MAC_5]
MSDU
DA = MAC_5
SA = MAC_1
FromDS = 1
ToDS = 1
DA = MAC_5
SA = MAC_1
TA = MAC_2
RA = MAC_3
FromDS = 1
ToDS = 1
DA = MAC_5
SA = MAC_1
TA = MAC_3
RA = MAC_4
DA = MAC_5
SA = MAC_1

Addition to the 802.11 Standard

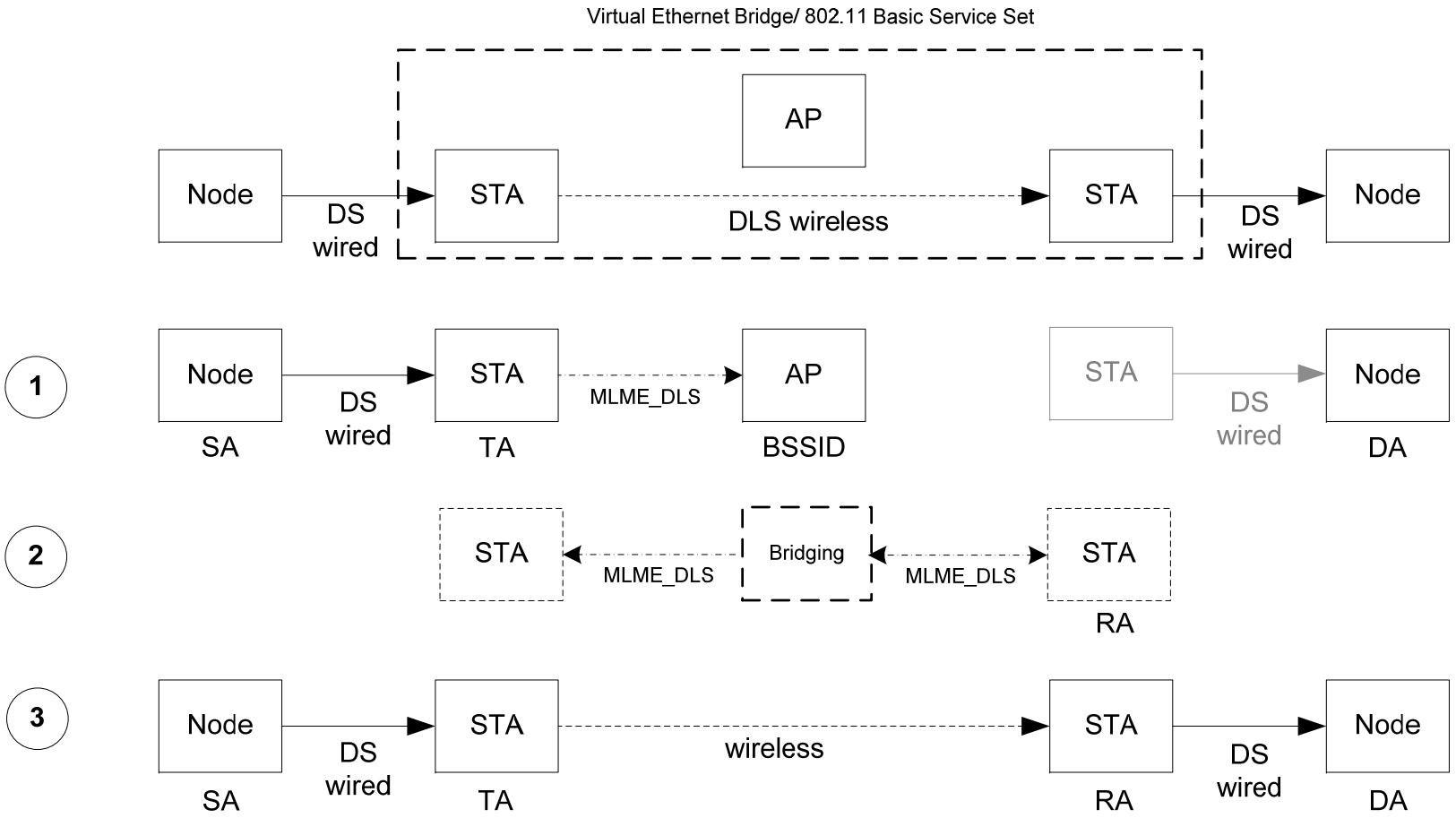
- New Element in Beacon and Probe Response
  - AP indicates it BSS Bridging Capability in a new BSS Bridging Element in Beacon and Probe Response
  - AP BSS bridging Capability is controlled by a dot11BSSBridgingCapabilityEnabled parameter
- New Action Frames <TBD>
  - AP control to STA ports (i.e. block port…)

New [To DS = Set, From DS = Set] Handling

- STA originated MSDU received by AP:
  - AP performs a lookup to the AP Bridging table with the Destination Address (DA) to retrieve the MAC address of the STA bridging the DA and use it as the Receiver Address (RA) of the forwarded MSDU
  - MSDU with unknown or Multicast DA addresses are broadcasted by the AP

- AP originated MSDU received by STA:
  - If the DA is a Broadcast/Multicast Address, the STA checks the MSDU Sequence Number or TDI (to match any of the SNs (or TIDs) of the latest Multicast MSDUs by this STA:
    - If match, the STA discards the receive frame
    - Otherwise the STA extracts the (DA,SA) and uses them as the (DA,SA) of the MSDU bridged by the STA

New DLS Bridging Traffic Type



DLS Mode Bridging

- For Direct Link Setup mode, a new MLME-BDLS request primitive could be specified with the DA MAC address replacing the STA MAC address as parameter:

  MLME-BDLS.request (
  PeerDAMACAddress,
  DLSTimeoutValue,
  DLSResponseTimeout)

- The associated confirm primitive returns the STA MAC address bridging the DA MAC address :

  MLME-BDLS.confirm (
  PeerDAMACAddress,
  PeerSTAMACAddress,
  ResultCode,
  CapabilityInformation,
  DLSTimeoutValue,
  SupportedRates)

Thank You

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