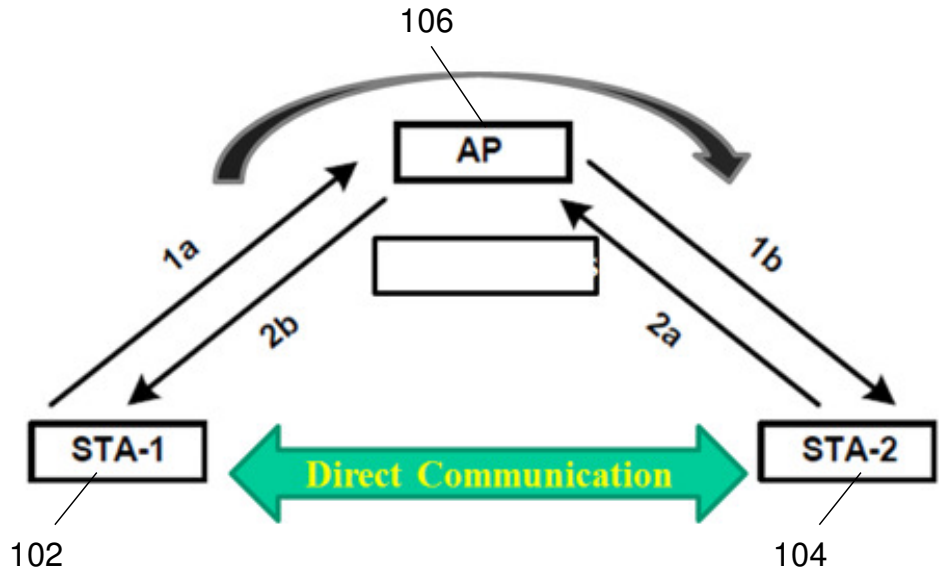


100

Figure 1

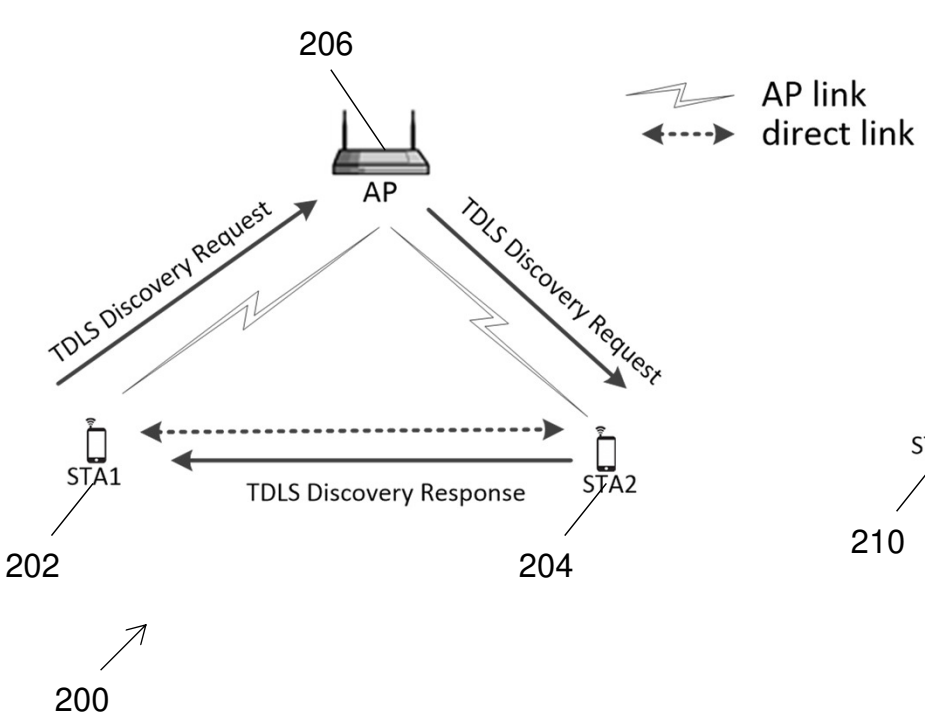


Figure 2A

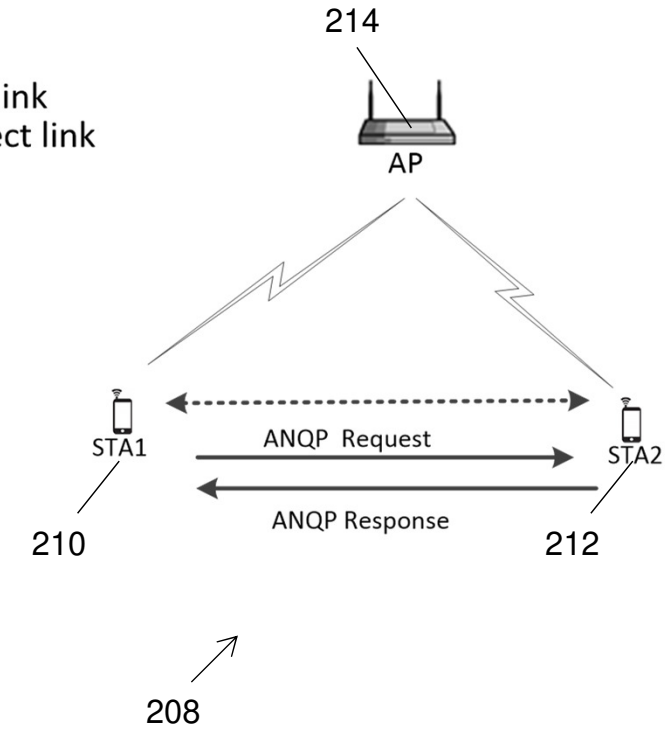


Figure 2B

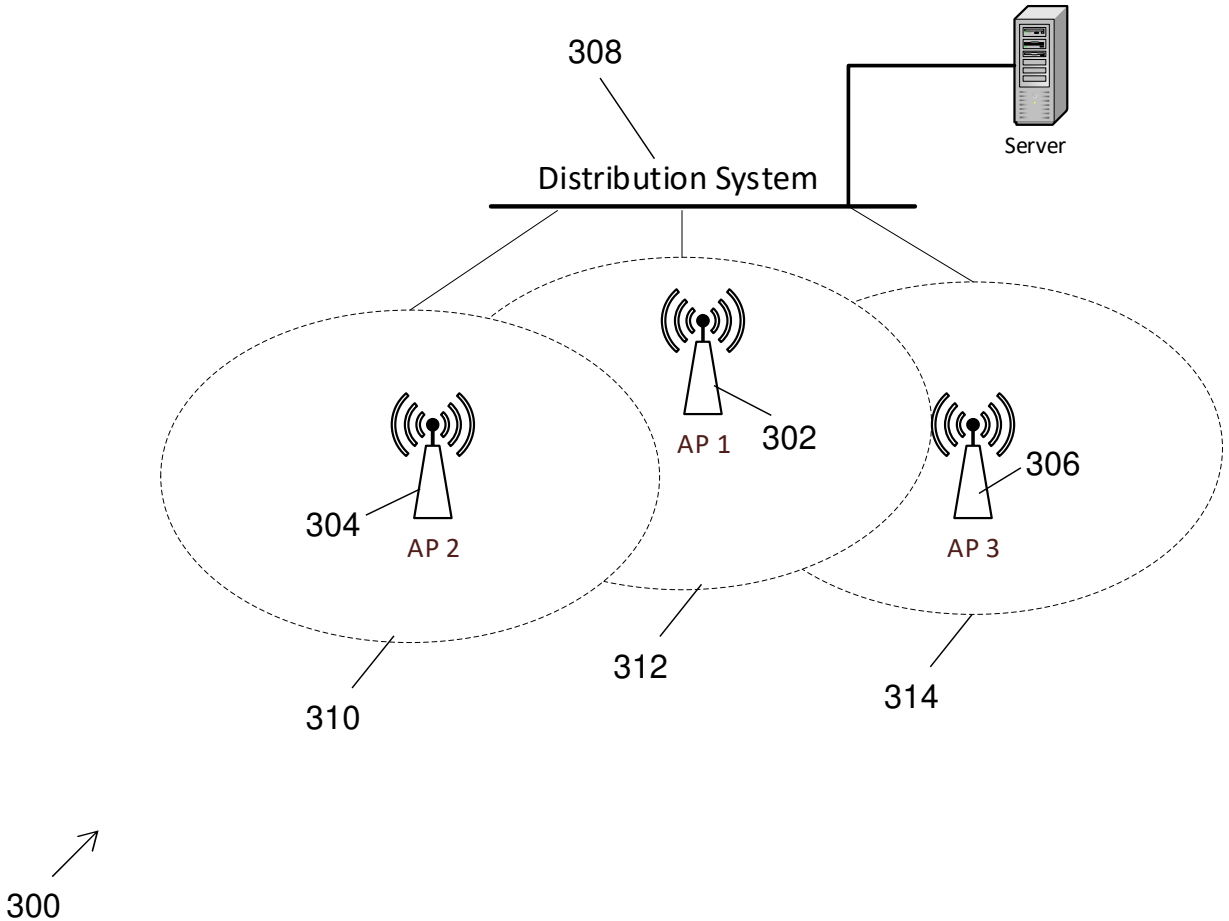
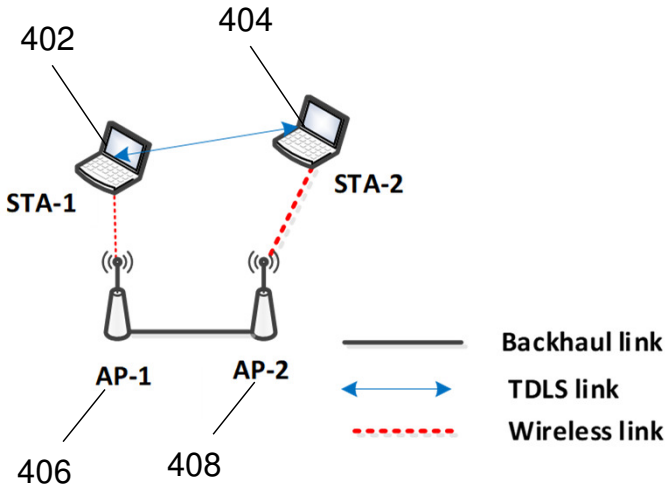

308
Server
Distribution System
AP 1
302
304
AP 2
306
AP 3
310
312
314
300

Figure 3


402
404
STA-1
STA-2
AP-1
AP-2
406
408
Backhaul link
TDLS link
Wireless link

400

Figure 4

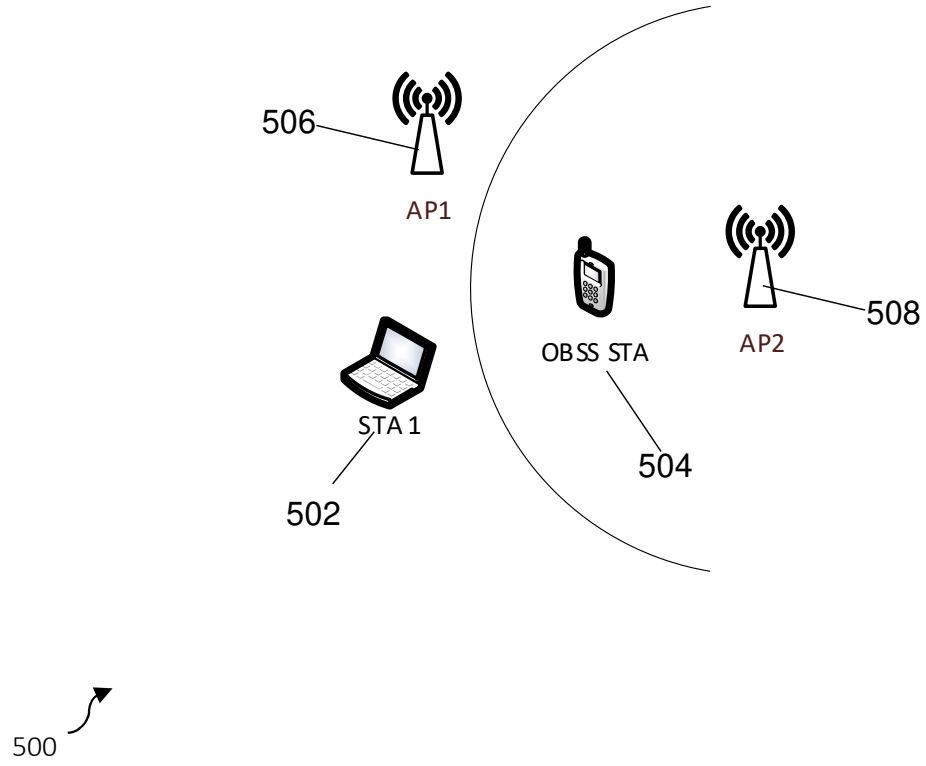


Figure 5

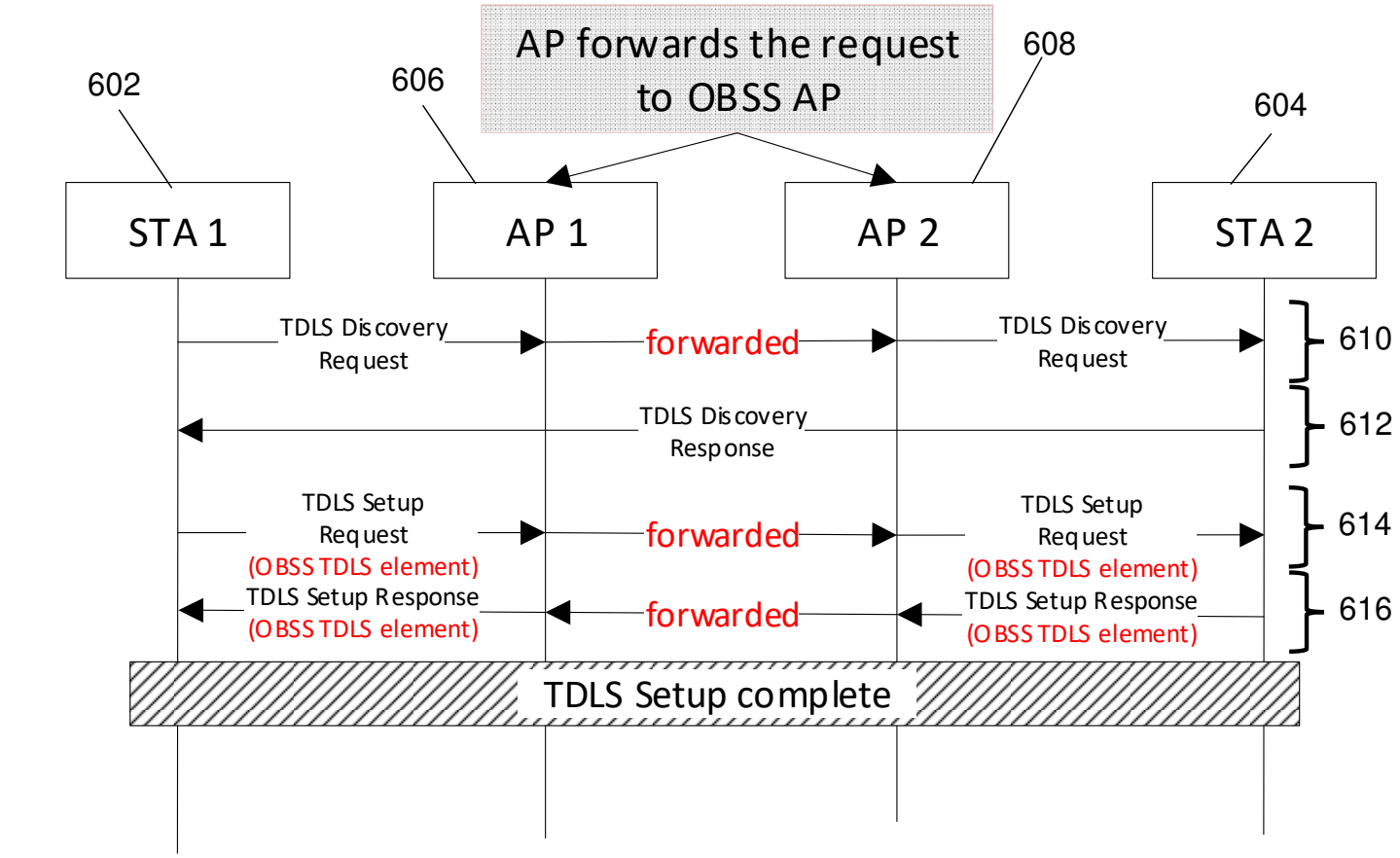

AP forwards the request to OBSS AP
608
602
606
604
STA 1
AP 1
AP 2
STA 2
TDLS Discovery Request
forwarded
TDLS Discovery Request
610
TDLS Discovery Response
612
TDLS Setup Request
(OBSS TDLS element)
forwarded
TDLS Setup Request
(OBSS TDLS element)
614
TDLS Setup Response
(OBSS TDLS element)
forwarded
TDLS Setup Response
(OBSS TDLS element)
616
TDLS Setup complete
600

Figure 6

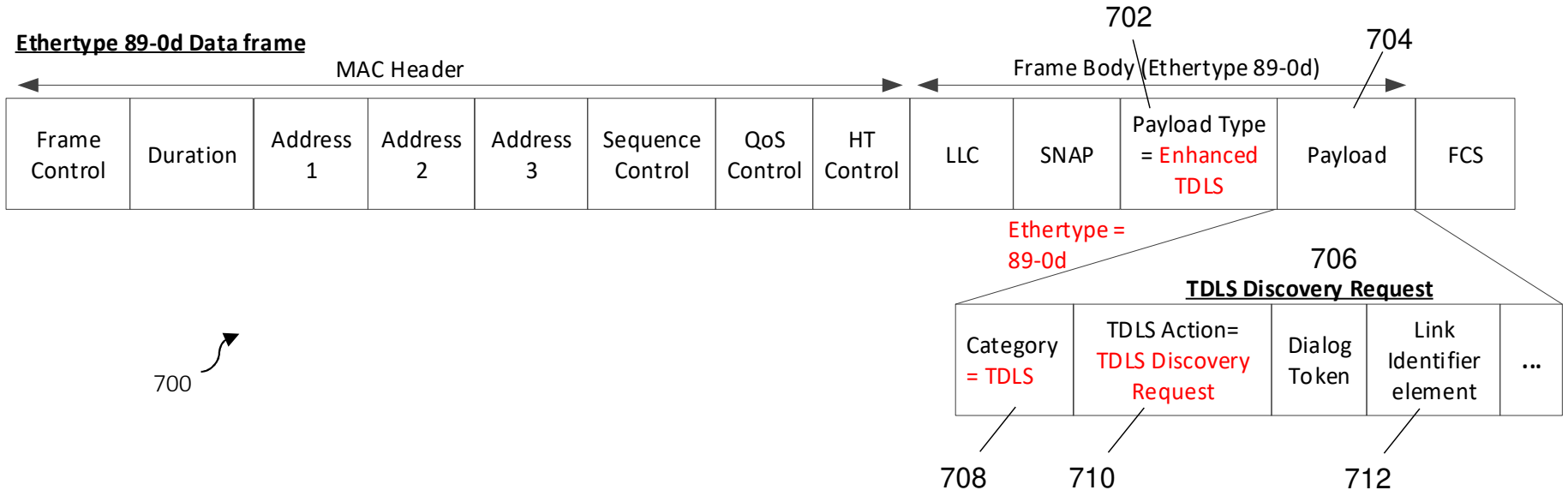


Figure 7A

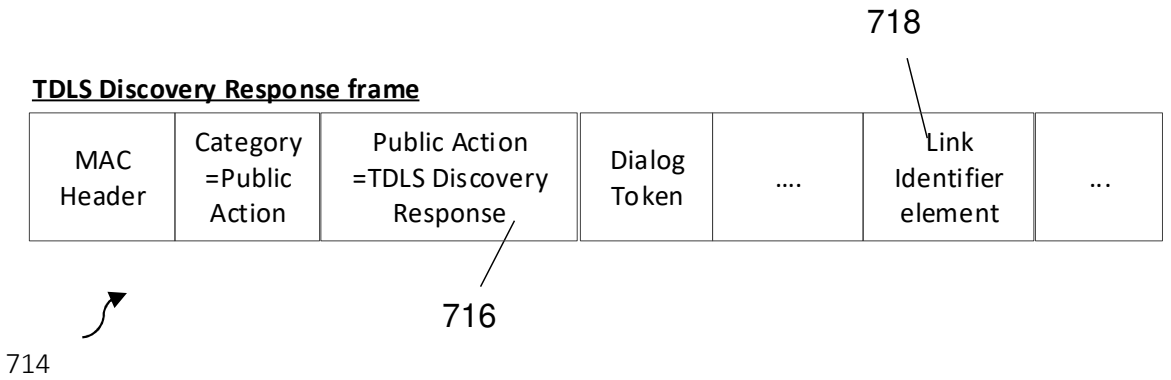


Figure 7B

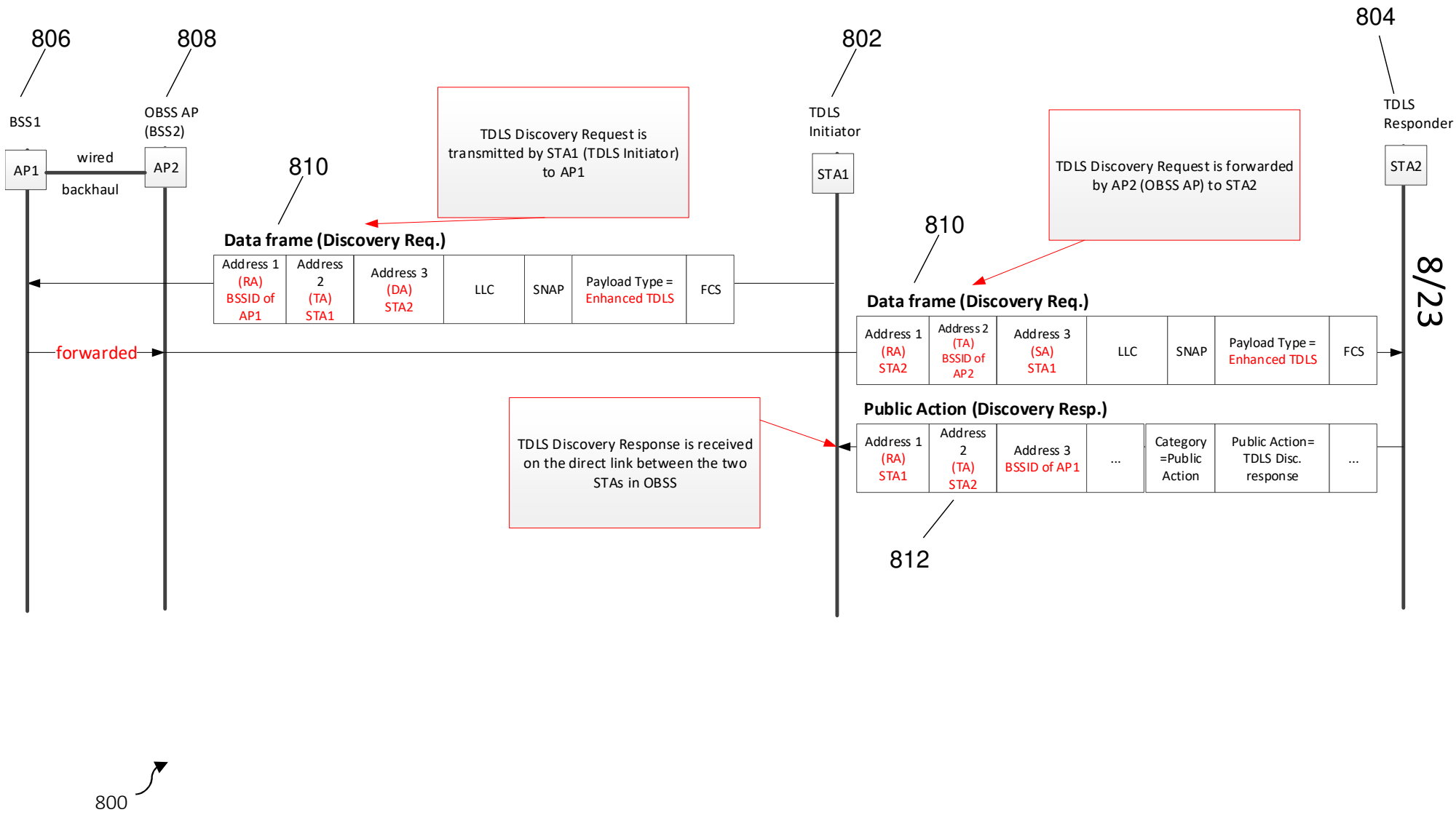

806
808
802
804
BSS1
OBSS AP
(BSS2)
TDLS
Initiator
TDLS
Responder
AP1
wired
backhaul
AP2
STA1
STA2
810
TDLS Discovery Request is transmitted by STA1 (TDLS Initiator) to AP1
TDLS Discovery Request is forwarded by AP2 (OBSS AP) to STA2
Data frame (Discovery Req.)
Address 1 (RA) BSSID of AP1
Address 2 (TA) STA1
Address 3 (DA) STA2
LLC
SNAP
Payload Type = Enhanced TDLS
FCS
forwarded
Data frame (Discovery Req.)
Address 1 (RA) STA2
Address 2 (TA) BSSID of AP2
Address 3 (SA) STA1
LLC
SNAP
Payload Type = Enhanced TDLS
FCS
TDLS Discovery Response is received on the direct link between the two STAs in OBSS
Public Action (Discovery Resp.)
Address 1 (RA) STA1
Address 2 (TA) STA2
Address 3 BSSID of AP1
...
Category =Public Action
Public Action= TDLS Disc. response
...
812
800
8/23

Figure 8

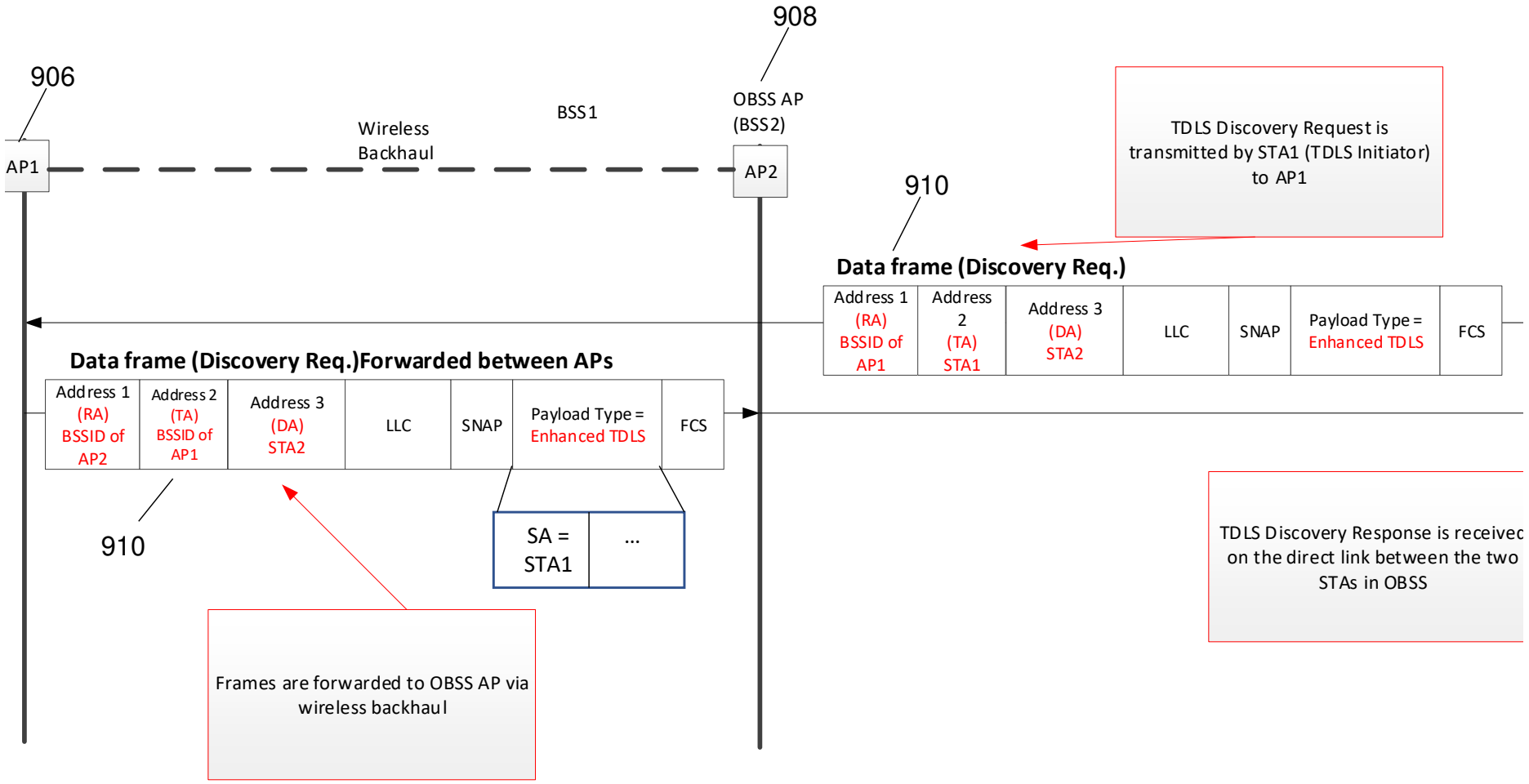


Figure 9 continued on page 10

Figure 9

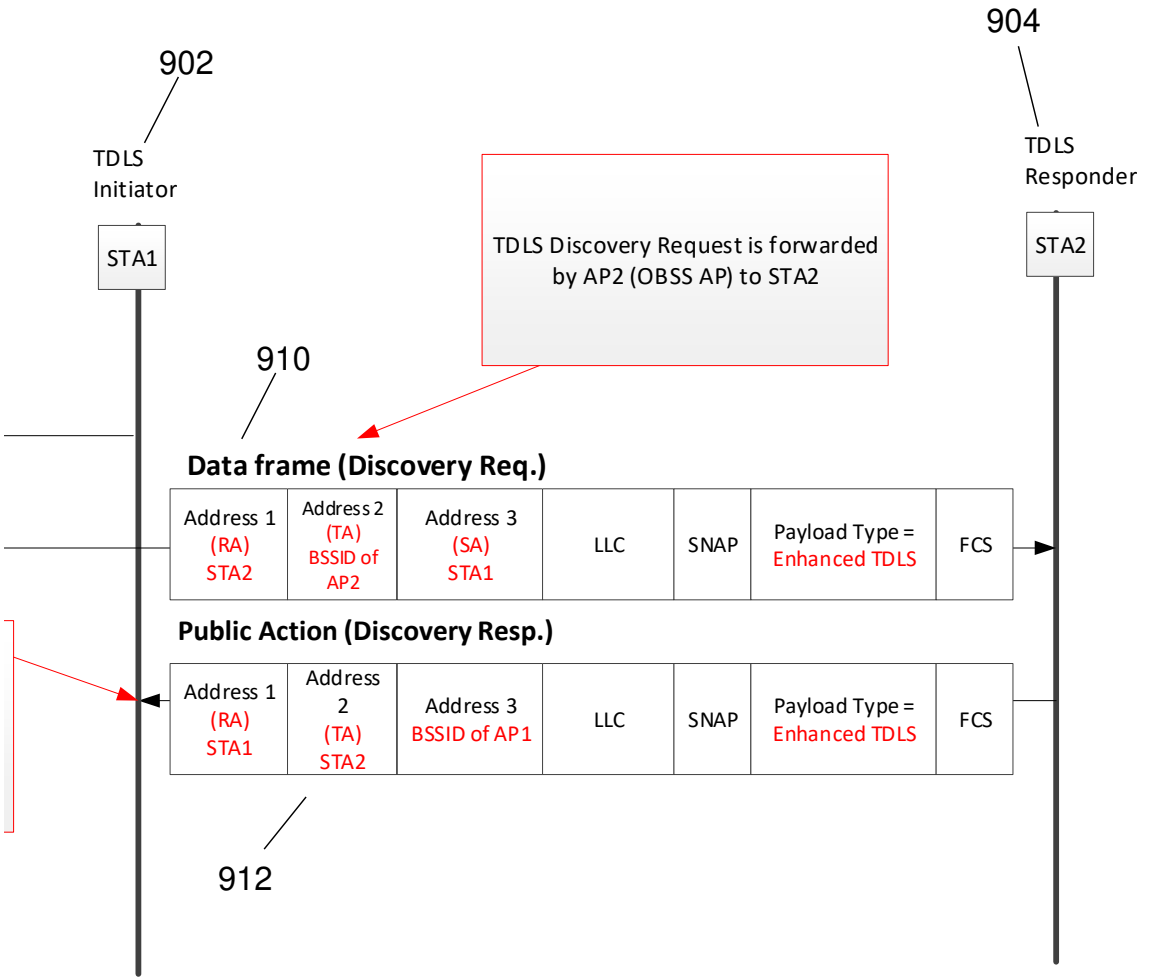


Figure 9 continued from page 9

Figure 9

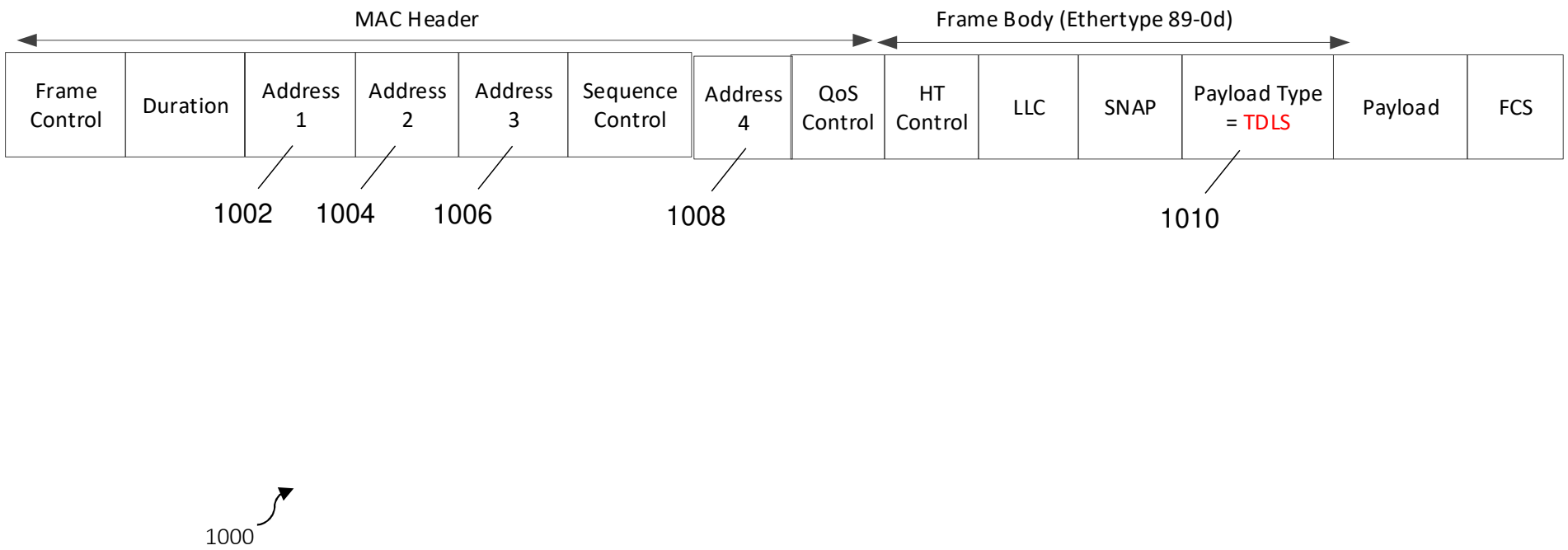

MAC Header
Frame Body (Ethertype 89-0d)
Frame Control
Duration
Address 1
Address 2
Address 3
Sequence Control
Address 4
QoS Control
HT Control
LLC
SNAP
Payload Type = TDLS
Payload
FCS
1002
1004
1006
1008
1010
1000

Figure 10

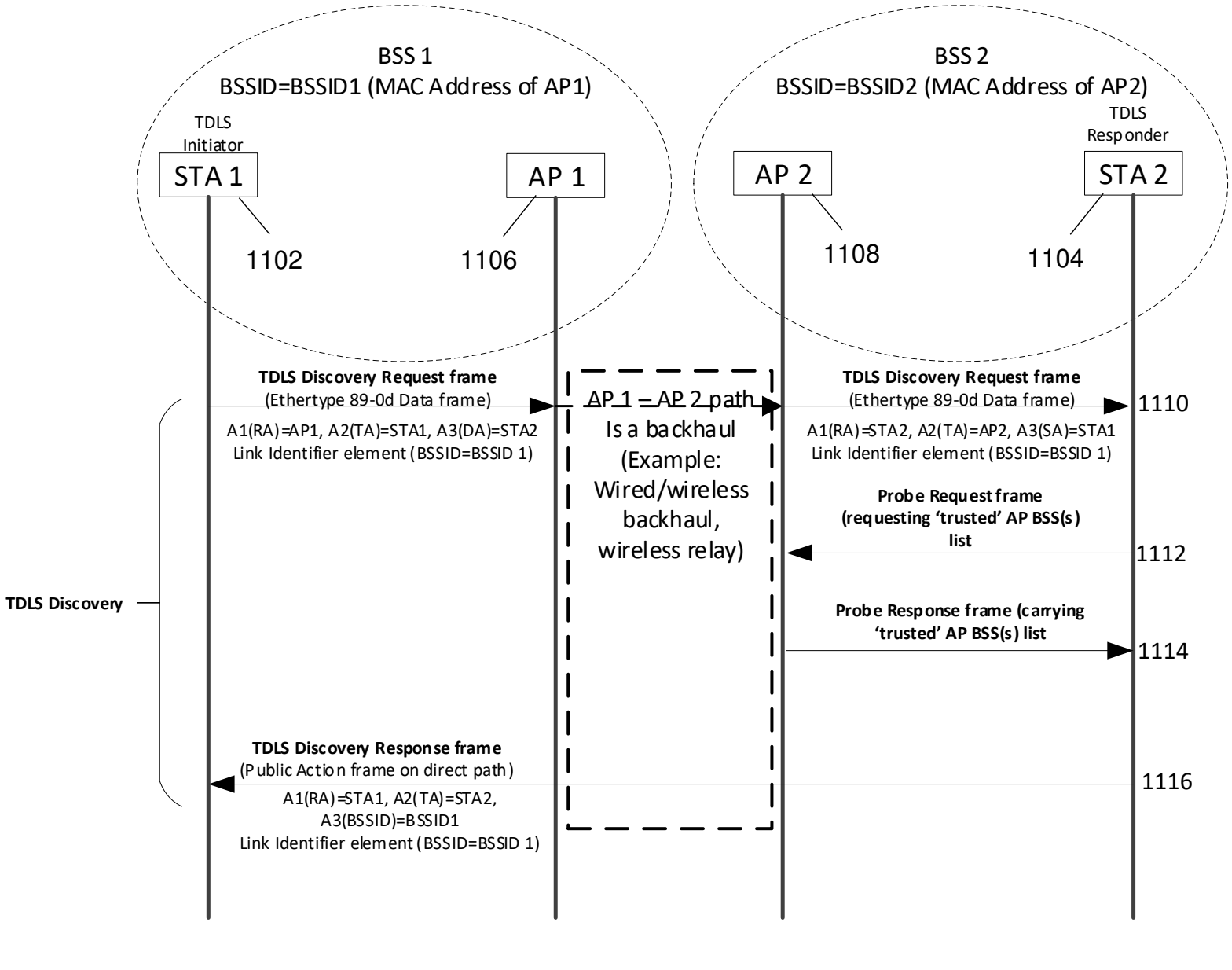

BSS 1
BSSID=BSSID1 (MAC Address of AP1)
BSS 2
BSSID=BSSID2 (MAC Address of AP2)
TDLS Initiator
STA 1
AP 1
AP 2
TDLS Responder
STA 2
1102
1106
1108
1104
TDLS Discovery Request frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=BSSID 1)
AP 1 – AP 2 path
Is a backhaul
(Example:
Wired/wireless
backhaul,
wireless relay)
TDLS Discovery Request frame
(Ethertype 89-0d Data frame)
1110
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=BSSID 1)
Probe Request frame
(requesting 'trusted' AP BSS(s)
list
1112
TDLS Discovery
Probe Response frame (carrying
'trusted' AP BSS(s) list
1114
TDLS Discovery Response frame
(Public Action frame on direct path)
1116
A1(RA)=STA1, A2(TA)=STA2,
A3(BSSID)=BSSID1
Link Identifier element (BSSID=BSSID 1)
1100

Figure 11

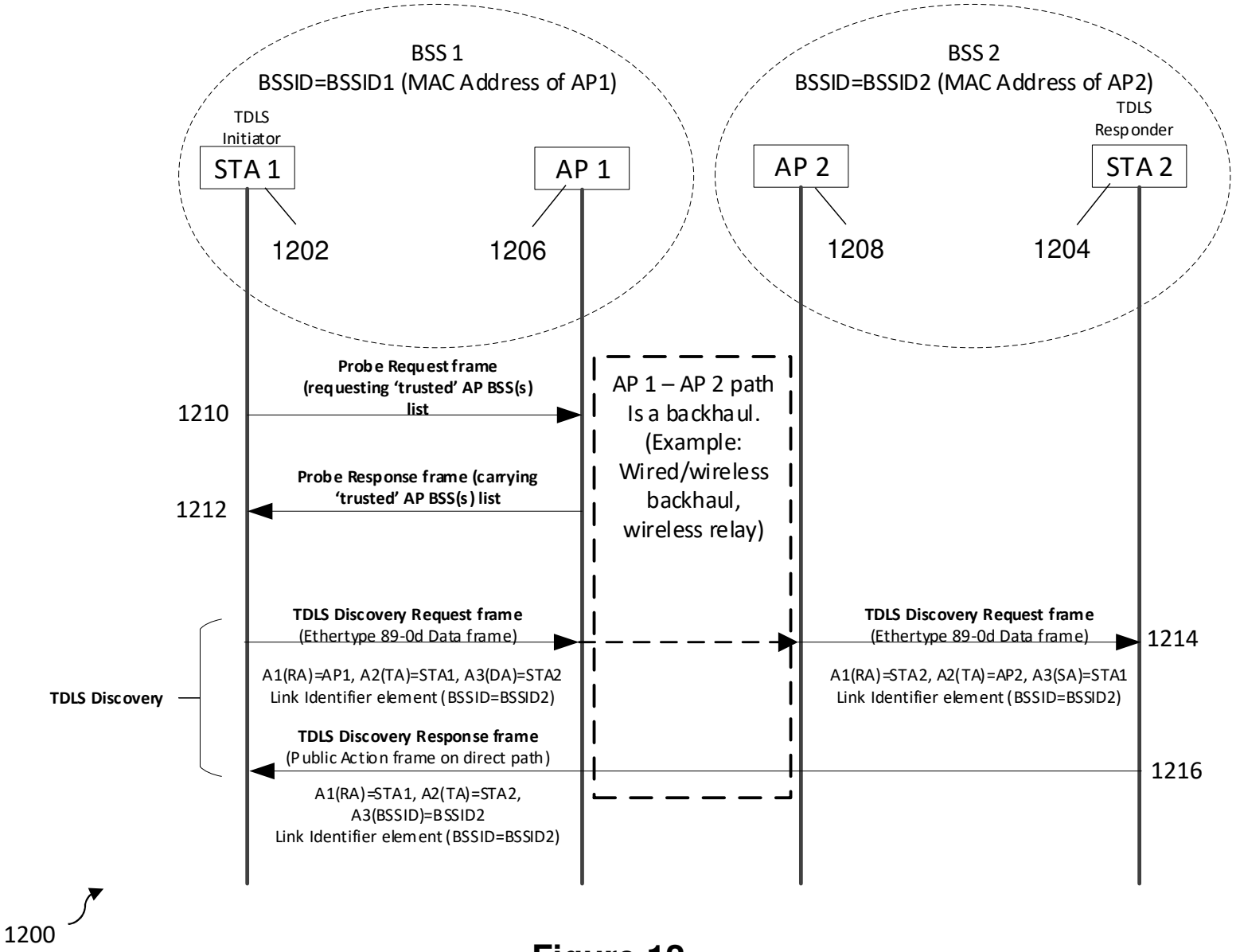

BSS 1
BSSID=BSSID1 (MAC Address of AP1)
BSS 2
BSSID=BSSID2 (MAC Address of AP2)
TDLS Initiator
STA 1
AP 1
AP 2
TDLS Responder
STA 2
1202
1206
1208
1204
Probe Request frame (requesting 'trusted' AP BSS(s) list
1210
AP 1 – AP 2 path Is a backhaul. (Example: Wired/wireless backhaul, wireless relay)
Probe Response frame (carrying 'trusted' AP BSS(s) list
1212
TDLS Discovery Request frame (Ethertype 89-0d Data frame)
TDLS Discovery Request frame (Ethertype 89-0d Data frame)
1214
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=BSSID2)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=BSSID2)
TDLS Discovery
TDLS Discovery Response frame (Public Action frame on direct path)
1216
A1(RA)=STA1, A2(TA)=STA2, A3(BSSID)=BSSID2
Link Identifier element (BSSID=BSSID2)
1200

Figure 12

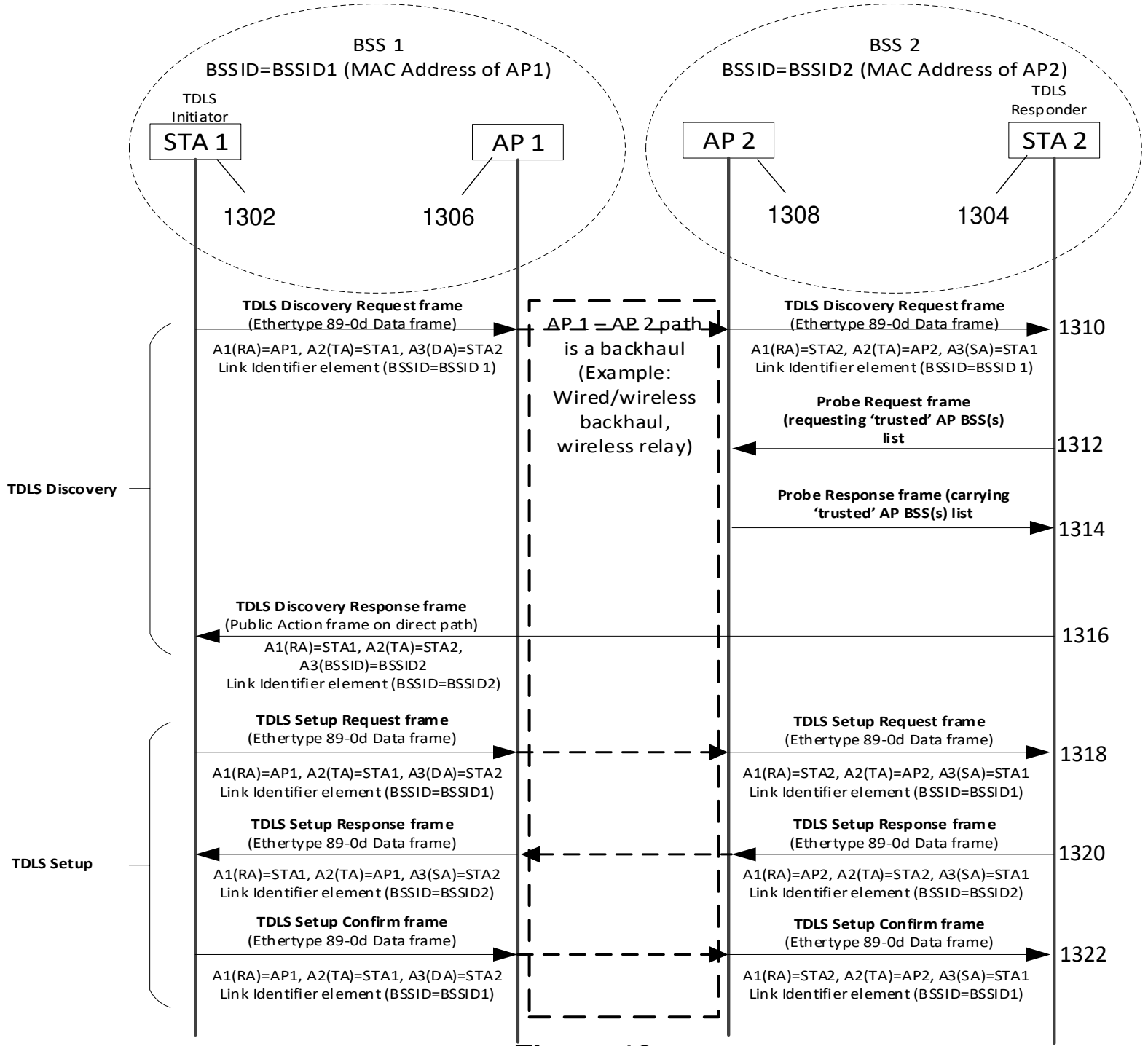

BSS 1
BSSID=BSSID1 (MAC Address of AP1)
BSS 2
BSSID=BSSID2 (MAC Address of AP2)
TDLS Initiator
STA 1
AP 1
AP 2
TDLS Responder
STA 2
1302
1306
1308
1304
TDLS Discovery Request frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=BSSID 1)
AP_1 – AP 2 path is a backhaul (Example: Wired/wireless backhaul, wireless relay)
TDLS Discovery Request frame
(Ethertype 89-0d Data frame)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=BSSID 1)
1310
Probe Request frame
(requesting 'trusted' AP BSS(s) list
1312
Probe Response frame (carrying 'trusted' AP BSS(s) list
1314
TDLS Discovery
TDLS Discovery Response frame
(Public Action frame on direct path)
A1(RA)=STA1, A2(TA)=STA2,
A3(BSSID)=BSSID2
Link Identifier element (BSSID=BSSID2)
1316
TDLS Setup Request frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=BSSID1)
TDLS Setup Request frame
(Ethertype 89-0d Data frame)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=BSSID1)
1318
TDLS Setup Response frame
(Ethertype 89-0d Data frame)
A1(RA)=STA1, A2(TA)=AP1, A3(SA)=STA2
Link Identifier element (BSSID=BSSID2)
TDLS Setup Response frame
(Ethertype 89-0d Data frame)
A1(RA)=AP2, A2(TA)=STA2, A3(SA)=STA1
Link Identifier element (BSSID=BSSID2)
1320
TDLS Setup
TDLS Setup Confirm frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=BSSID1)
TDLS Setup Confirm frame
(Ethertype 89-0d Data frame)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=BSSID1)
1322
1300

Figure 13

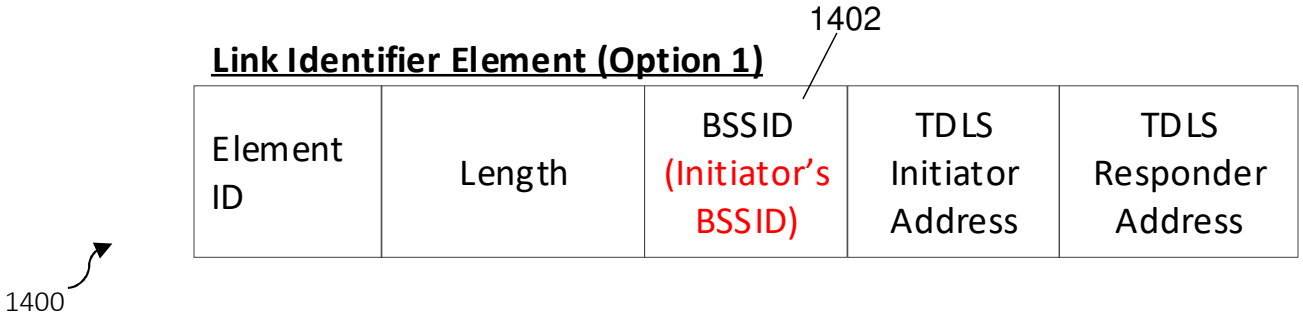


Figure 14A

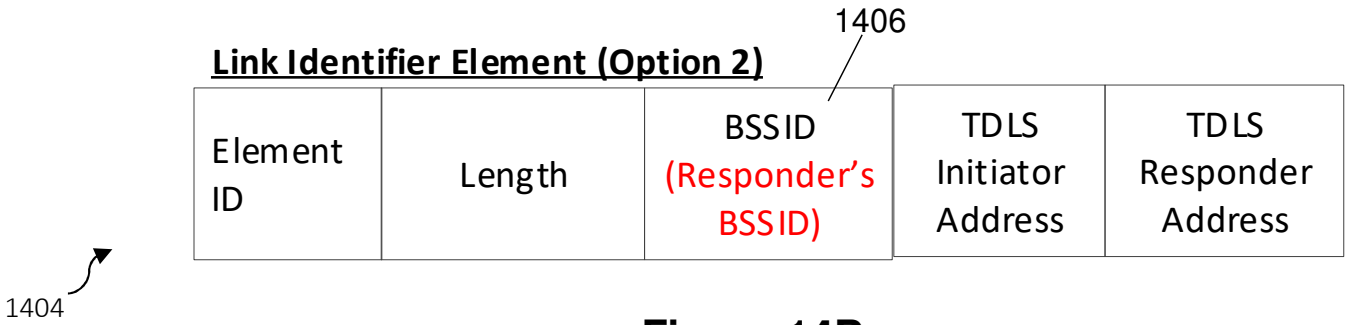


Figure 14B

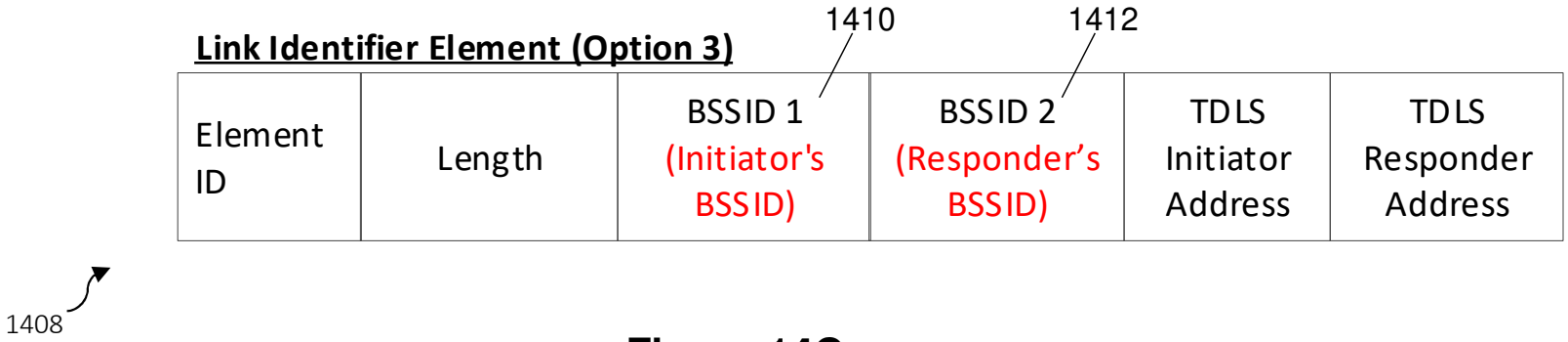


Figure 14C

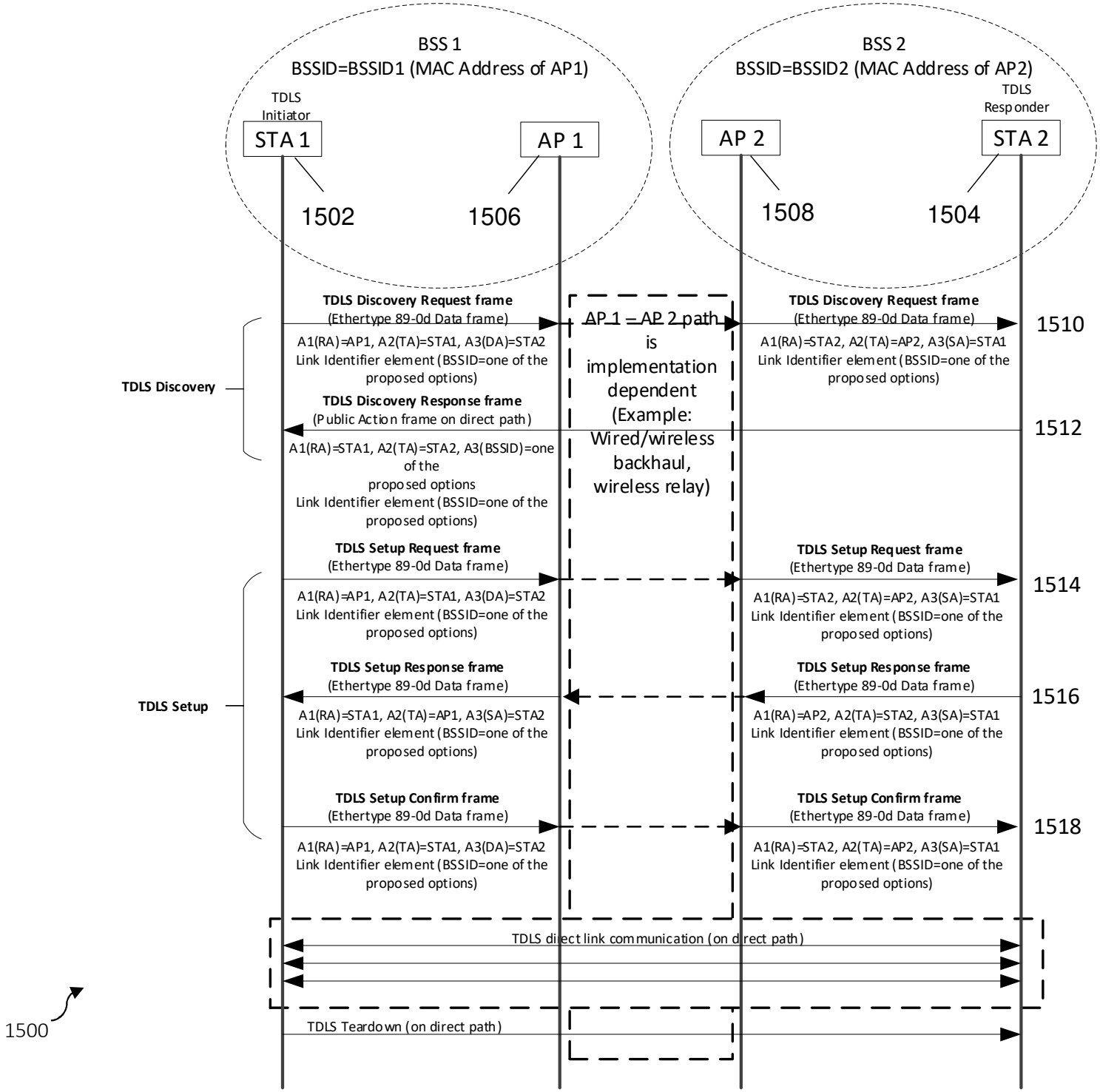

BSS 1
BSSID=BSSID1 (MAC Address of AP1)
BSS 2
BSSID=BSSID2 (MAC Address of AP2)
TDLS Initiator
STA 1
AP 1
AP 2
TDLS Responder
STA 2
1502
1506
1508
1504
TDLS Discovery Request frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=one of the proposed options)
AP 1 – AP 2 path is implementation dependent (Example: Wired/wireless backhaul, wireless relay)
TDLS Discovery Request frame
(Ethertype 89-0d Data frame)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=one of the proposed options)
1510
TDLS Discovery
TDLS Discovery Response frame
(Public Action frame on direct path)
A1(RA)=STA1, A2(TA)=STA2, A3(BSSID)=one of the proposed options
Link Identifier element (BSSID=one of the proposed options)
1512
TDLS Setup Request frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=one of the proposed options)
TDLS Setup Request frame
(Ethertype 89-0d Data frame)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=one of the proposed options)
1514
TDLS Setup
TDLS Setup Response frame
(Ethertype 89-0d Data frame)
A1(RA)=STA1, A2(TA)=AP1, A3(SA)=STA2
Link Identifier element (BSSID=one of the proposed options)
TDLS Setup Response frame
(Ethertype 89-0d Data frame)
A1(RA)=AP2, A2(TA)=STA2, A3(SA)=STA1
Link Identifier element (BSSID=one of the proposed options)
1516
TDLS Setup Confirm frame
(Ethertype 89-0d Data frame)
A1(RA)=AP1, A2(TA)=STA1, A3(DA)=STA2
Link Identifier element (BSSID=one of the proposed options)
TDLS Setup Confirm frame
(Ethertype 89-0d Data frame)
A1(RA)=STA2, A2(TA)=AP2, A3(SA)=STA1
Link Identifier element (BSSID=one of the proposed options)
1518
TDLS direct link communication (on direct path)
TDLS Teardown (on direct path)
1500

Figure 15

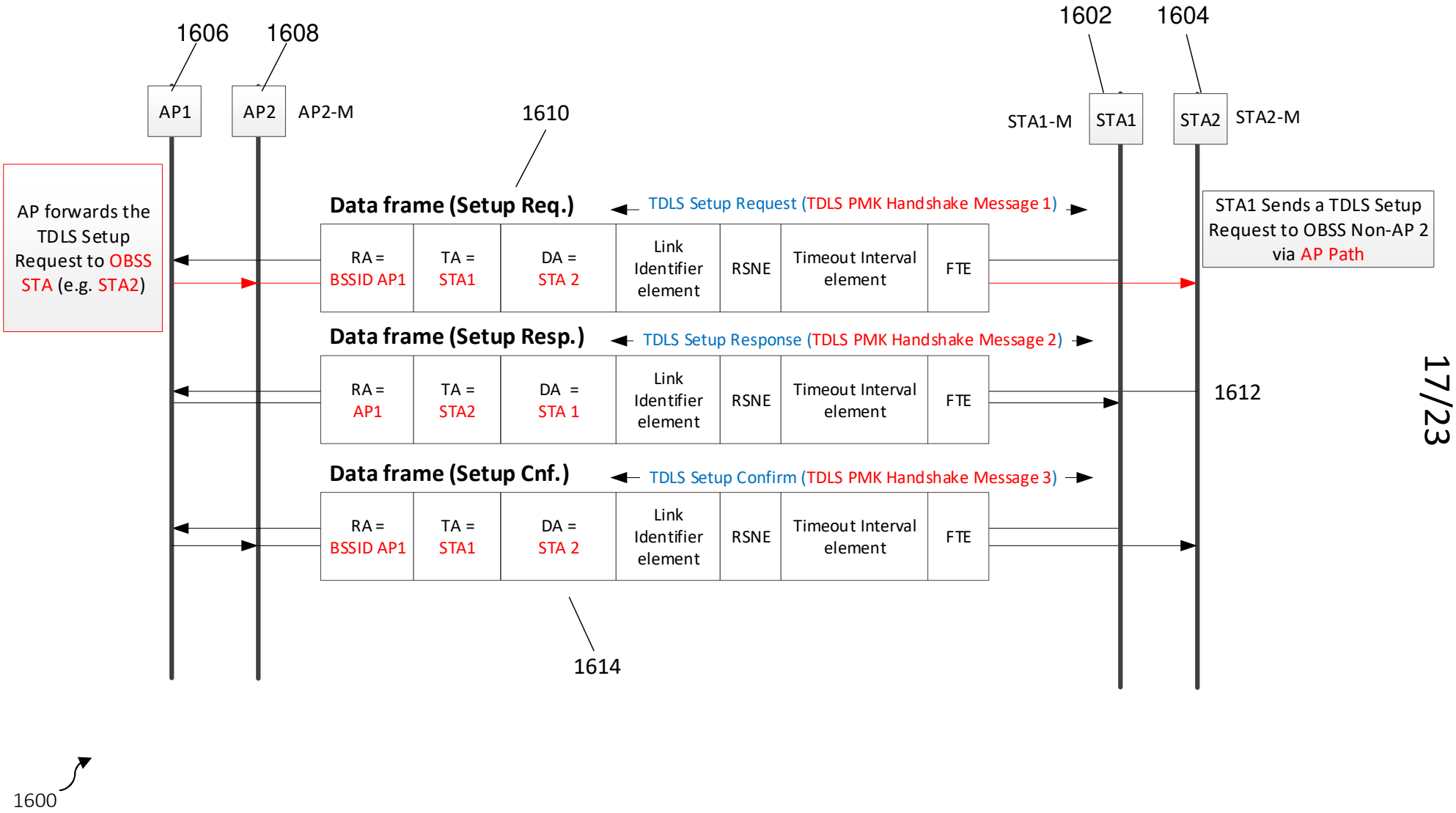

1606
1608
1602
1604
AP1
AP2
AP2-M
1610
STA1-M
STA1
STA2
STA2-M
AP forwards the TDLS Setup Request to OBSS STA (e.g. STA2)
Data frame (Setup Req.)
TDLS Setup Request (TDLS PMK Handshake Message 1)
STA1 Sends a TDLS Setup Request to OBSS Non-AP 2 via AP Path
RA = BSSID AP1
TA = STA1
DA = STA 2
Link Identifier element
RSNE
Timeout Interval element
FTE
Data frame (Setup Resp.)
TDLS Setup Response (TDLS PMK Handshake Message 2)
RA = AP1
TA = STA2
DA = STA 1
1612
Data frame (Setup Cnf.)
TDLS Setup Confirm (TDLS PMK Handshake Message 3)
1614
1600

Figure 16

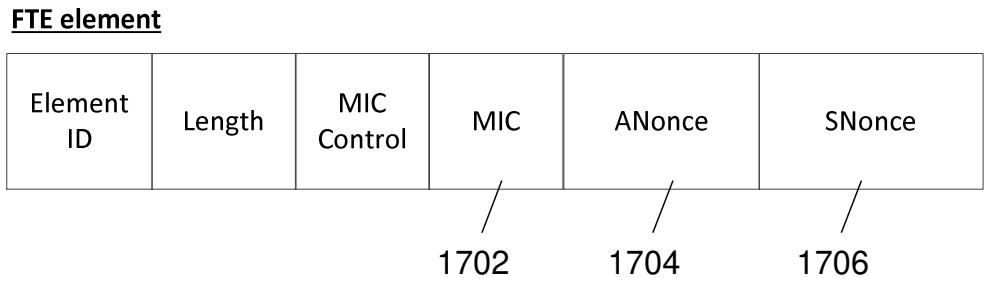

FTE element
Element ID
Length
MIC Control
MIC
ANonce
SNonce
1702
1704
1706
1700

Figure 17

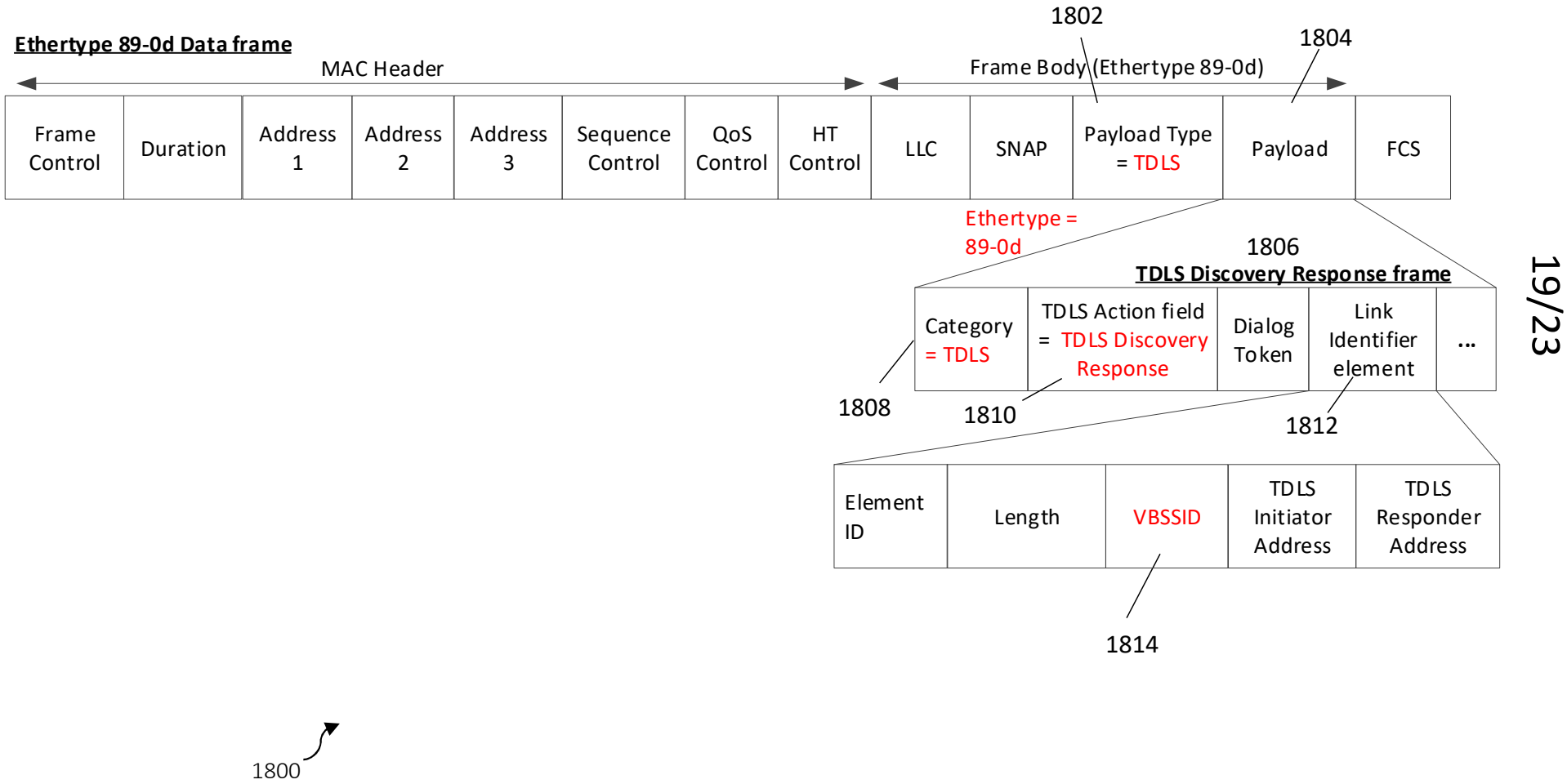
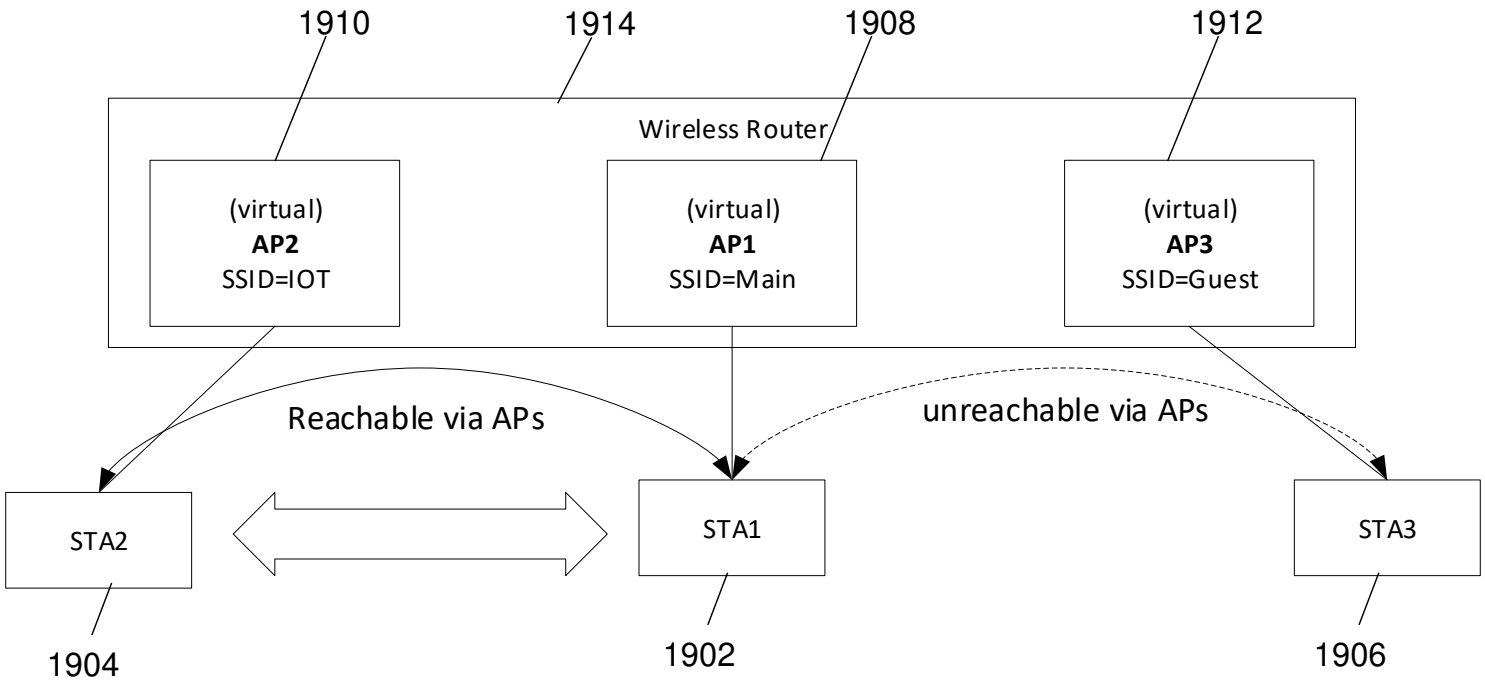

Ethertype 89-0d Data frame
MAC Header
Frame Body (Ethertype 89-0d)
1802
1804
Frame Control
Duration
Address 1
Address 2
Address 3
Sequence Control
QoS Control
HT Control
LLC
SNAP
Payload Type = TDLS
Payload
FCS
Ethertype = 89-0d
1806
TDLS Discovery Response frame
Category = TDLS
TDLS Action field = TDLS Discovery Response
Dialog Token
Link Identifier element
...
1808
1810
1812
Element ID
Length
VBSSID
TDLS Initiator Address
TDLS Responder Address
1814
1800

Figure 18



1900

Figure 19

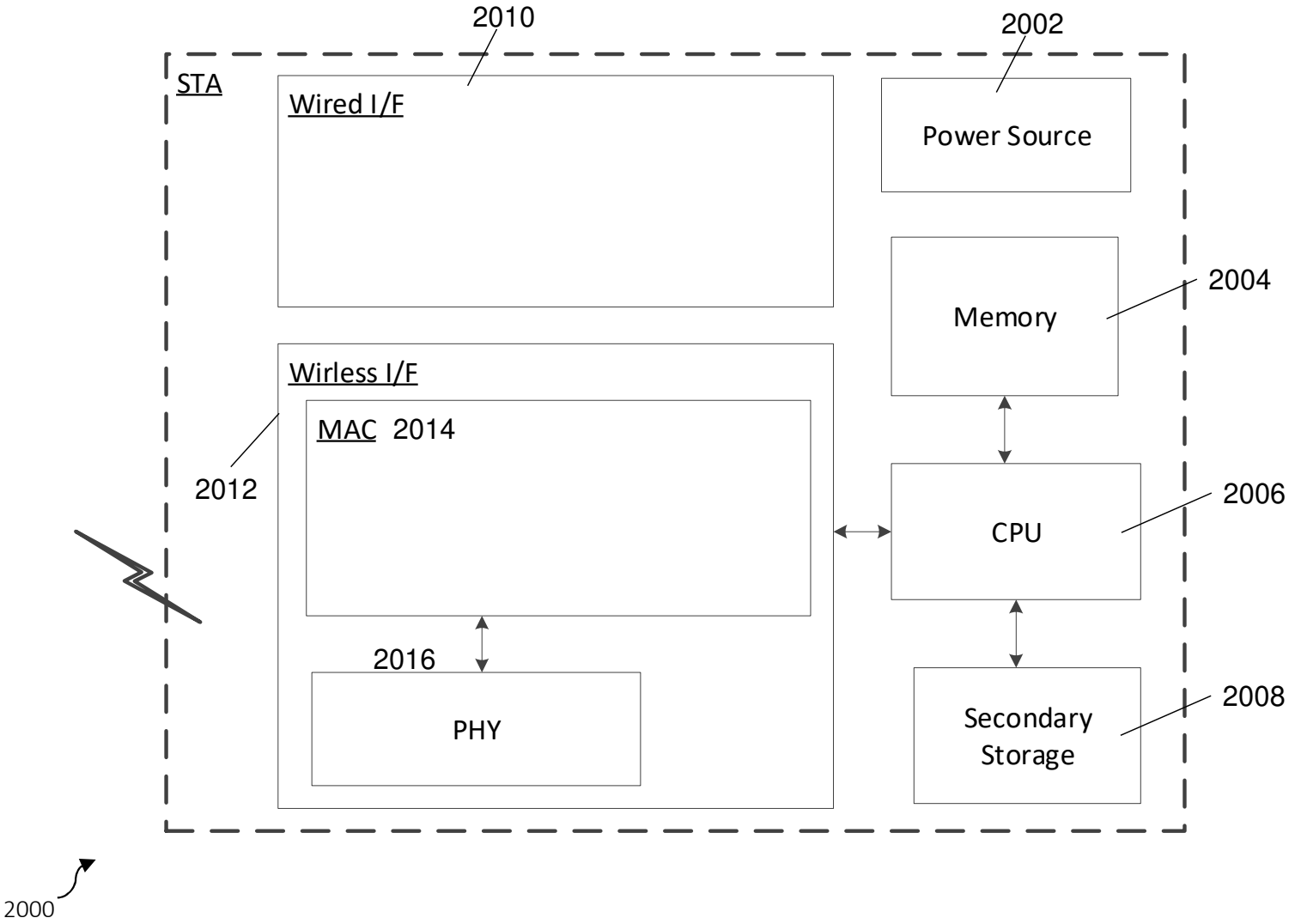

2010
2002
STA
Wired I/F
Power Source
Memory
2004
Wirless I/F
MAC 2014
2012
CPU
2006
2016
PHY
Secondary Storage
2008
2000

Figure 20

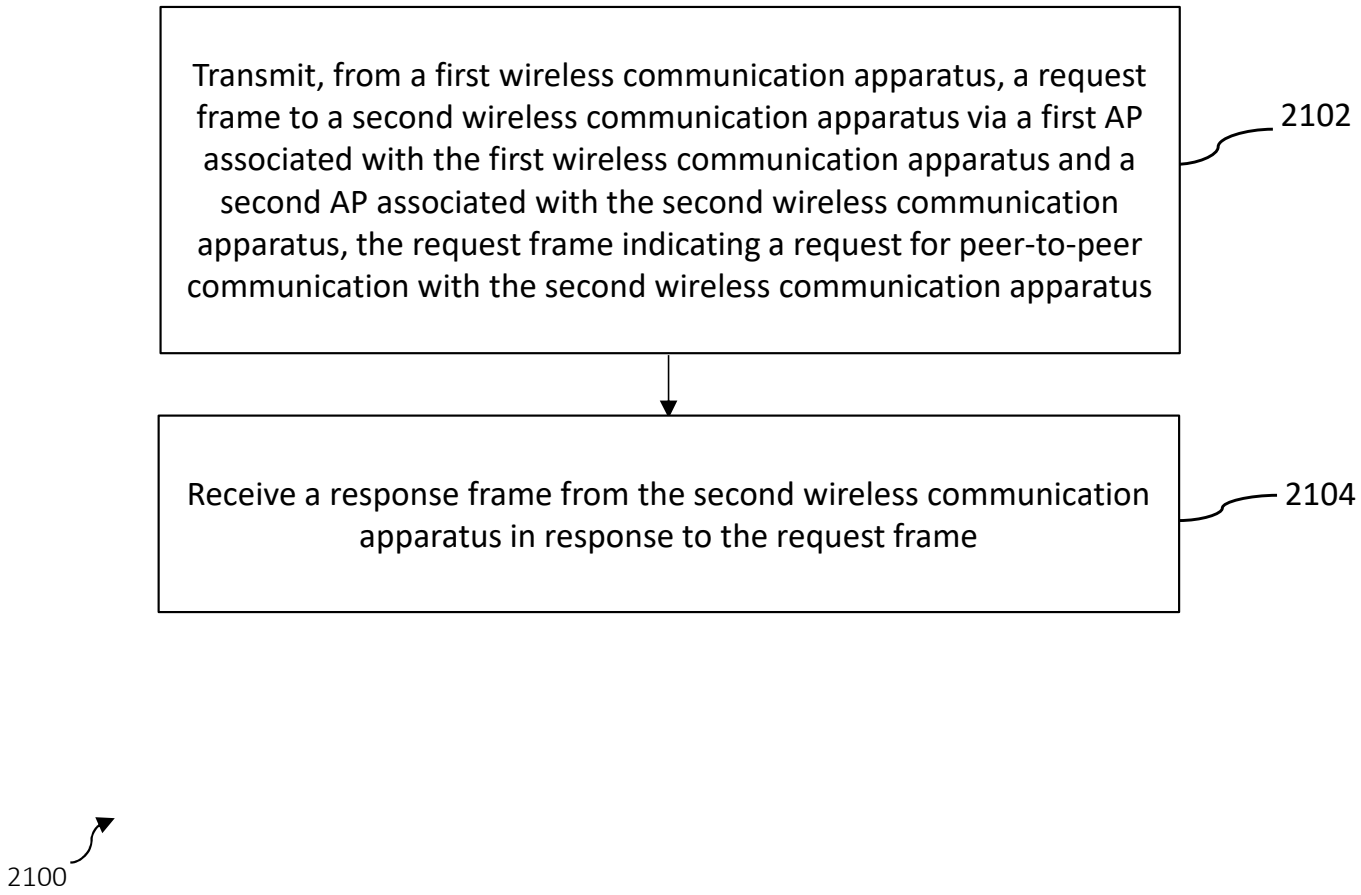

Transmit, from a first wireless communication apparatus, a request frame to a second wireless communication apparatus via a first AP associated with the first wireless communication apparatus and a second AP associated with the second wireless communication apparatus, the request frame indicating a request for peer-to-peer communication with the second wireless communication apparatus
2102
Receive a response frame from the second wireless communication apparatus in response to the request frame
2104
2100

Figure 21

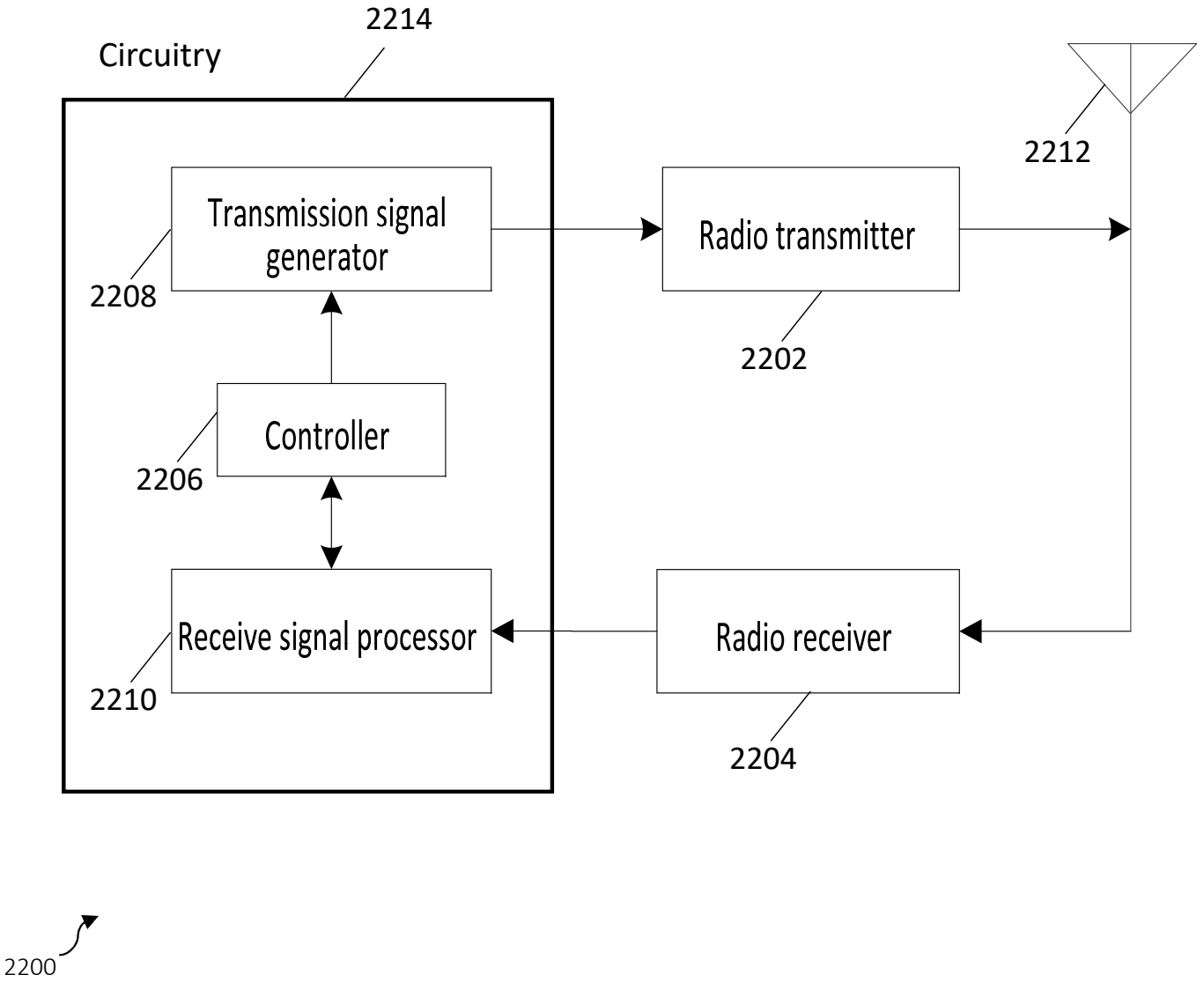

2214
Circuitry
2212
Transmission signal generator
2208
Radio transmitter
2202
Controller
2206
Receive signal processor
2210
Radio receiver
2204
2200

Figure 22