Potential testing scenarios when DUT may unexpectedly fail Bonjour conformance test

1. Used abbreviations

DTIM – Delivery traffic indication map

AP   – access point

DNS   – Domain name service

MDNS – multicast DNS

DUT   – device under test

2. Description

DUT may fail Bonjour conformance test unexpectedly when it is connected via Wifi and uses **wifi power-save** mode during PROBING and SUBSEQUENT conflict sub-tests. The failure will happen due to the nature of how wifi protocol works with clients which try to save some power. Two testing-case scenarios when DUT may fail the Bonjour conformance test are described further.

3. Testing scenario 1

If DUT strictly follows MDNS specification(interval between 2 subsequent MDNS probes is 250ms) and it happened that two MDNS probes fall in one DTIM interval a tester may fail the DUT during PROBING test stage even though the DUT doesn't violate the probing rules. If two subsequent probes fall between one DTIM interval the tester will see the MDNS Probe 2 before the DUT sees the Conflict and responds to it accordingly. According to the MDNS RFC:

**Section 8.2 Paragraph 3, Multicast DNS RFC**: When a host that is probing for a record sees another host issue a   query for the same record, it consults the Authority Section of that query. If it finds any resource record(s) there which answers the query, then it compares the data of that (those) resource record(s) with its own tentative data. We consider first the simple case of a host probing for a single record, receiving a simultaneous probe from another host also probing for a single record. The two records are compared and the lexicographically later data wins. This means that if the host finds that its own data is lexicographically later, it simply ignores the other host's probe. If the host finds that its own data is lexicographically earlier, then **it defers to the winning host by waiting one second**, and then begins probing for this record again

But it appears to the tester that the DUT sends **MDNS Probe 2** without 1 second wait and therefore violates the specification. The same test running on the device without powersave will not fail. When there is at least one wifi station which is in power-save the wifi AP is buffering multicast frames received between DTIMs and sends them to all of its wifi clients at the end of every DTIM interval.

The problem is depicted in the timeline diagram below (_**Fig.1**_). Events 1 to 12 which can be seen on the diagram are described below
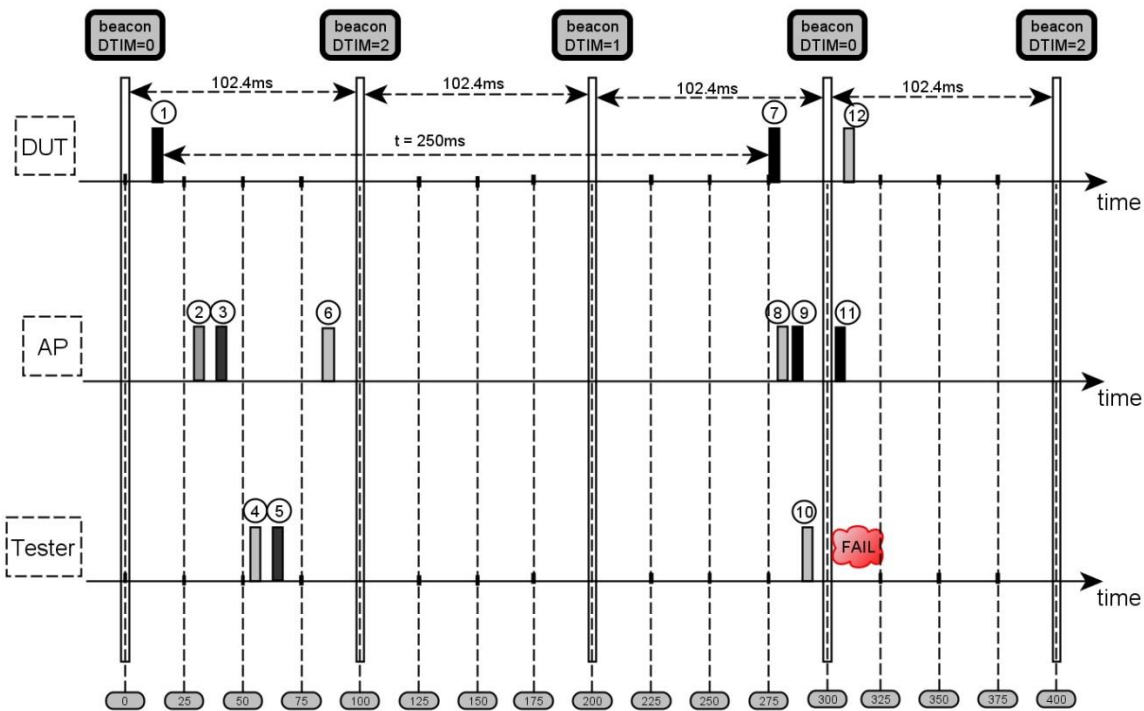
Fig.1

1. **MDNS Probe 1** is sent from the DUT to the access point
2. AP receives **MDNS Probe 1**
3. AP rebroadcasts **MDNS probe 1** on the Ethernet interface
4. BCT Tester receives the **MDNS Probe 1**
5. BCT Tester sends a conflicting probe
6. Conflict is received by the AP and since it is a multicast frame and DUT is sleeping AP buffers the frame and keeps it until the next DTIM
7. 250ms after the **MDNS Probe 1** was sent the DUT sends **MDNS Probe 2**
8. AP receives MDNS Probe 2
9. AP rebroadcasts MDNS probe 2 on the Ethernet interface
10. BCT tester receives **MDNS Probe 2** and stops with failure. It thinks that the Conflict was not addressed by the DUT. In order to address the conflict DUT must defer its probing for a second and re-probe again. During the test DUT didn't hear the conflict and sent **MDNS Probe 2** 250ms before the **MDNS Probe 1**
11. After the DTIM wifi access point starts sending buffered multicast frames to all its clients.
12. DUT receives a conflicting probe. However, it is too late. Tester already counted a fail.

We managed to pass PROBING test by increasing the probing interval to 315ms which is slightly bigger than the DTIM interval on Airport express base stations, however if we strictly follow the spec we fail Bonjour conformance test 1 out of 10 times.

4. Testing scenario 2

During the SUBSEQUENT CONFLICT test the tester sends us a conflicting probe. DUT is in power-save mode and doesn't see the probe until the end of the current DTIM interval. If 2 conflicting probes fall between one DTIM period the tester will make an assumption that DUT doesn't address the conflict and therefore DUT doesn't follow the main rule of the MDNS specification:

The DUT being in power-save won't be able to immediately reset its conflicted record. The tester will wait for 250 milliseconds after the first probe was issued and seeing no immediate reaction from the DUT will abruptly stop the subsequent conflict test failing DUT.
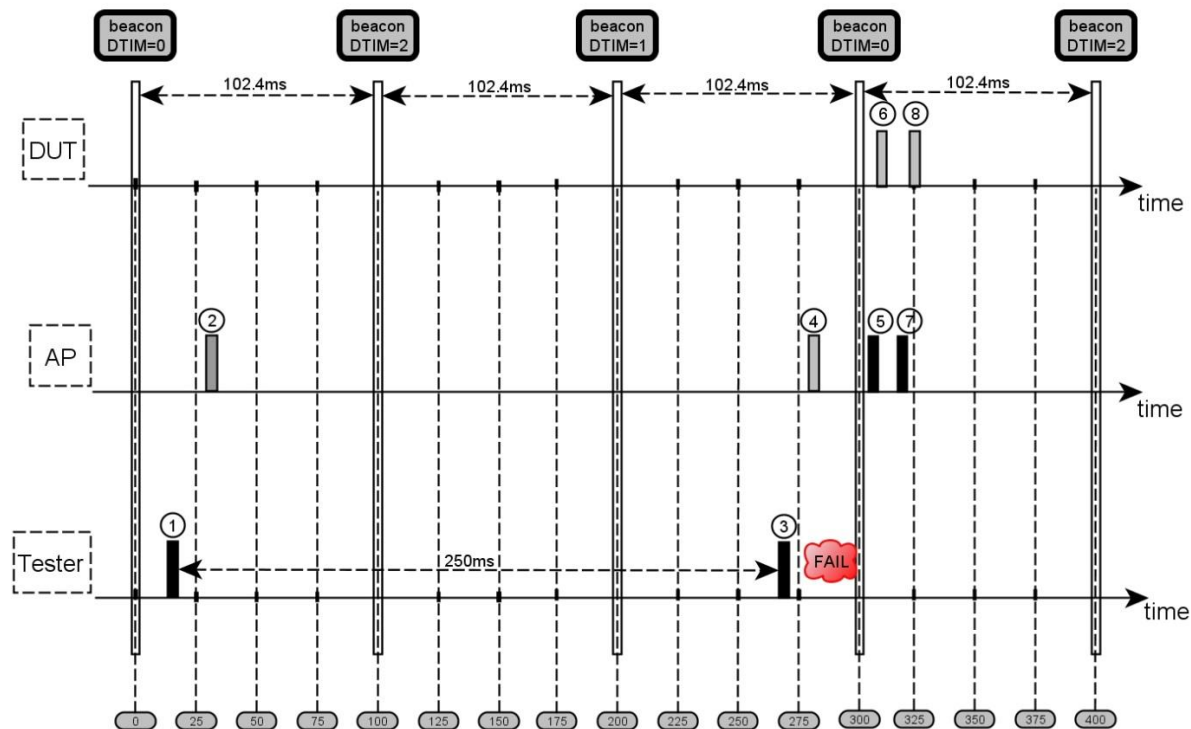

Fig.2

The problem is depicted in the timeline diagram below (***Fig.2***). Events 1 to 8 which can be seen on the diagram are described below:

1. Tester sends a ***Conflicting Probe 1***
2. AP receives a ***Conflicting Probe 1*** and buffers it until the next DTIM
3. 250 milliseconds after the ***Conflicting probe 1*** the tester issues a ***Conflicting Probe 2*** and since It hasn't seen any DUT re-probing attempts tester counts a fail
4. AP receives ***Conflicting Probe 2*** and buffers is until the next DTIM
5. After the DTIM AP sends ***Conflicting Probe 1*** to all of its wireless clients including DUT.
6. DUT receives the ***Conflicting Probe 1***
7. AP sends ***Conflicting Probe 2***
8. DUT receives ***Conflicting Probe 2***. However it is already too late because Tester finished the test with fail.

Currently this sub-test fails on our side 1 out of 10 times and we will need your assistance to fix it. We assume that inside the tester application timeout for expected re-probing answer during SUBSEQUENT

CONFLICT test must be increased to a value of maximum DTIM interval. If the AP's DTIM interval length is 3 beacons then the timeout value must be bigger than 3 * 102.4ms = 307.2ms.