NEW RADIO COMMUNICATION FOR NEW ERA

NRC7292 Application Note
(Dynamic Vendor IE)

Ultra-low power & Long-range Wi-Fi

Ver 1.6
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NEWRACOM, Inc.

NRC7292 Application Note (Dynamic Vendor IE in Beacon)
Ultra-low power & Long-range Wi-Fi Module

Office
Newracom, Inc.
505 Technology Drive, Irvine, CA 92618 USA
http://www.newracom.com

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1 Overview

This document describes the Dynamic Vendor IE feature. This feature is to transfer vendor specific information in a Beacon/Probe request/Probe response/Association request frame. As shown in Figure 1.1, a 11ah AP/STA can deliver up to 5 vendor specific information per Beacon/Probe request/Probe response/Association request frame. Furthermore, the number of vendor specific information and its contents can be changed dynamically with *iw* command. The Dynamic Vendor IE feature is supported only through the host mode.

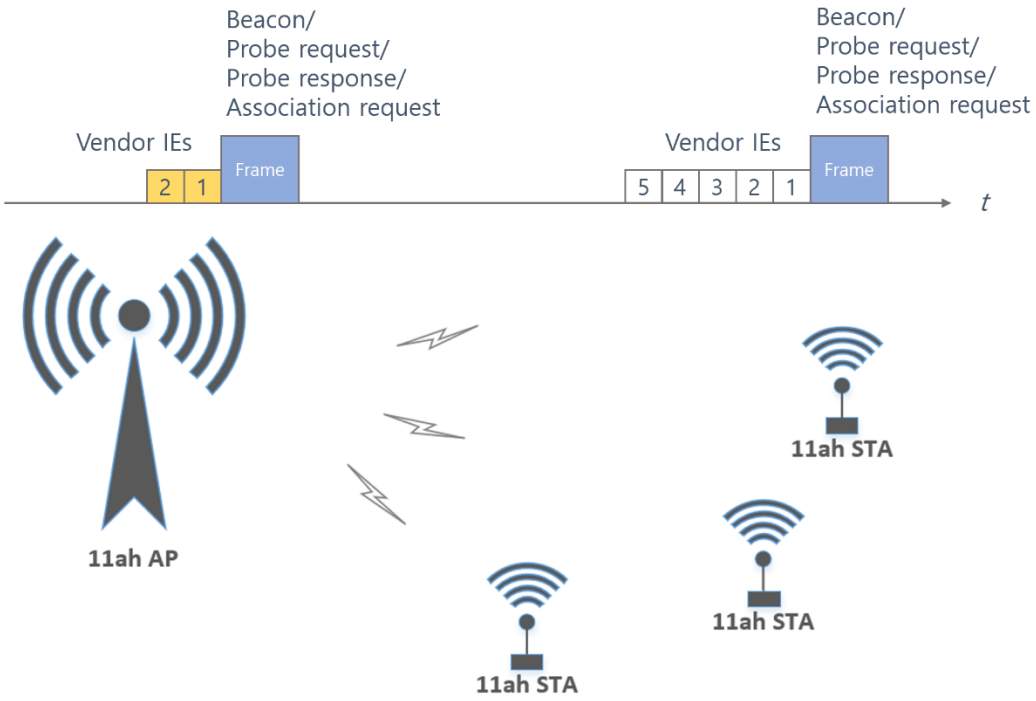

Figure 1.1 Concept of the Dynamic Vendor IE

2 How to use the Dynamic Vendor IE

2.1 Deliver vendor specific information

User can use *iw* command for vendor information delivery on the host terminal. Once the user executes the command, the vendor information is sent at the next Beacon/Probe request/Probe response/ Association request frame. User can run this command during 11ah AP/STA operation.

2.1.1 Usage

$*iw dev* <interface> *vendor send* <OUI> <Subcmd> <HEX data>

- Interface : 11ah interface (e.g. wlan0)
- OUI : Organization Unique Identifier (0xFCFFAA for IEEE Registration Authority)
- Subcmd : sub-command ID for adding/removing hex data.
  - 0x0 ~ 0x5 for adding vendor IE into Beacon frame
    Add a vendor specific IE in a beacon frame. If a vendor specific IE exists with the same sub-command, it will be updated with a new one.
    **** This can only be used in AP.***
  - 0xC ~ 0x10 for adding vendor IE into Probe Request frame
    Add a vendor specific IE in a probe request frame. If a vendor specific IE exists with the same sub-command, it will be updated with a new one.
    **** This can only be used in STA.***
  - 0x11 ~ 0x15 for adding vendor IE into Probe Response frame
    Add a vendor specific IE in a probe response frame. If a vendor specific IE exists with the same sub-command, it will be updated with a new one.
    **** This can only be used in AP.***
  - 0x16 ~ 0x1A for adding vendor IE into Association Request frame
    Add a vendor specific IE in an association request beacon frame. If a vendor specific IE exists with the same sub-command, it will be updated with a new one.
    **** This can only be used in STA.***
  - 0xDE 0x0~0x5 and 0xC~0x1A for removing vendor IE
    Remove a vendor specific IE which has corresponding sub-command ID. 'HEX data' should be used to designate the sub-command ID to be removed.
    For example, 0xDE 0x3 will remove a vendor specific IE which has the sub-command ID 0x3.
- HEX data : vendor specific information data in hex (up to 255 bytes)

2.1.2 Example

1. Deliver three vendor specific information in beacon and probe response frame (for AP)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0x0 0x01 0x02 0x03 0x04 (for beacon)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0x1 0x05 0x06 0x07 0x08 (for beacon)

$sudo iw dev wlan0 vendor send 0xFCFFAA 0x11 0x21 0x22 0x23 0x24 (for probe response)

2. Deliver two vendor specific information in probe request and association request frame (for STA)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0xC 0x11 0x12 0x13 0x14 (for probe request)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0x16 0x31 0x32 0x33 0x34 (for association request)

3. Remove three vendor specific information in beacon and probe response (for AP)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0xDE 0x0 (to remove beacon frame)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0xDE 0x1 (to remove beacon frame)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0xDE 0x11 (to remove probe response frame)

4. Remove two vendor specific information in probe request and association request frame (for STA)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0xDE 0xC (to remove probe request frame)
   $sudo iw dev wlan0 vendor send 0xFCFFAA 0xDE 0x16 (to remove association request frame)

2.2 Retrieve vendor specific information

User can retrieve the vendor specific information by using *iw* command. When the user executes this command, the retrieved vendor information printed out on the terminal.

2.2.1 Usage

```
$iw event -f
```

2.2.2 Example

1. When 11ah AP transfer three vendor specific IEs, “0x01020304”, “0x05060708” for beacon frame and “0x21222324” for probe response frame.
   $sudo iw event -f **(on STA)**

```
phy #6: vendor event fcffaa:0
vendor event: 08 00 00 00 01 02 03 04

phy #6: vendor event fcffaa:1
vendor event: 08 00 00 00 05 06 07 08

phy #6: vendor event fcffaa:0
vendor event: 08 00 00 00 01 02 03 04
```

```
phy #6: vendor event fcffaa:1
vendor event: 08 00 00 00 05 06 07 08

phy #6: vendor event fcffaa:17
vendor event: 08 00 00 00 21 22 23 24
```

2. When 11ah STA transfer three vendor specific IEs, “0x11121314” for probe request frame and “0x31323334” for association request frame.
   $sudo iw event -f **(on AP)**

```
phy #4: vendor event fcffaa:12
vendor event: 08 00 00 00 11 12 13 14

phy #4: vendor event fcffaa:12
vendor event: 08 00 00 00 11 12 13 14

wlan0: new station 02:00:eb:21:dd:70
wlan0: STA 02:00:eb:21:dd:70 IEEE 802.11: authenticated
wlan0 (phy #4): mgmt TX status (cookie 92): acked
phy #4: vendor event fcffaa:22
vendor event: 08 00 00 00 31 32 33 34

phy #4: vendor event fcffaa:22
vendor event: 08 00 00 00 31 32 33 34
```

3 Revision History

Revision No	Date	Comments
Ver 1.0	7/5/2019	Initial version for customer release created
Ver 1.1	5/20/2022	Add description about removing sub-command
Ver 1.2	7/5/2022	Update description about deliver vendor specific information
Ver 1.3	7/8/2022	Update 2.1
Ver 1.4	7/14/2022	Fix typos of 2.1
Ver 1.5	6/12/2023	Update for v1.4 SW package
Ver 1.6	9/8/2023	Update for Probe request, Probe response, Association Request vendor IE