



# **NRC7394 Application Note**

## **(Dynamic Vendor IE)**

**Ultra-low power & Long-range Wi-Fi**

**Ver 1.1**  
**Sept. 8, 2023**

**NEWRACOM, Inc.**

## **NRC7394 Application Note (Dynamic Vendor IE in Beacon) Ultra-low power & Long-range Wi-Fi Module**

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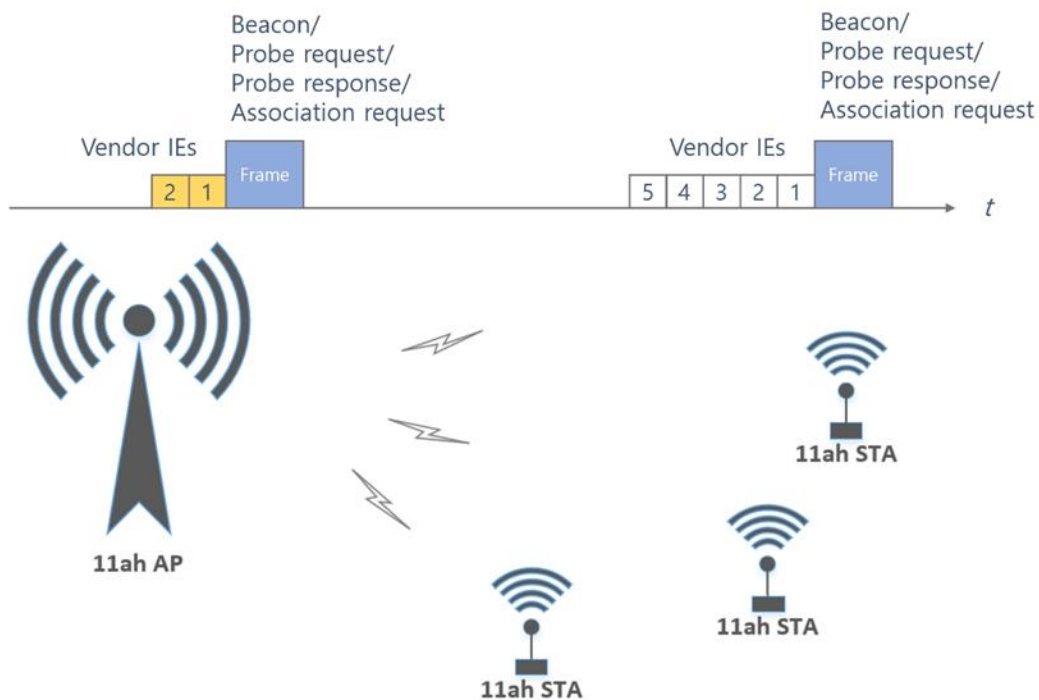
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# 1 Overview

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	4/5/2023	Initial version
Ver 1.1	9/8/2023	Update for Probe request, Probe response, Association Request vendor IE