

A syntax for the RADIUS Connect-Info attribute used in Wi-Fi networks

<https://datatracker.ietf.org/doc/draft-grayson-connectinfo/>

Authors: Mark Grayson (Cisco), Joshua Redmore (Cablelabs), Sri Gundavelli (Cisco), Bruno Tomas (WBA), Michael Sym (Single Digits), Blair Bullock (Boldyn Networks)

Reminder of the motivation

- Increasing adoption of RADIUS between **separate administrative domains**.
- Increasing adoption of RADIUS **without bi-lateral agreement** between NAS and AAA provider.
- Increasingly **complex wireless environment** with multiple overlapping networks.
- Handling **more diversity** in systems, across different Wi-Fi generations and spectrum allocations.
- AAA providers want to ensure their users are getting a **great Wi-Fi experience**.
- Industry benefits from **consistent framework** to provide visibility of Wi-Fi network metrics.
- Reliable insights into likely Wi-Fi experience increases confidence and **drives adoption**.

The above factors led to the WBA establishing its [Access Network Metrics Project](#)

Example of existing Wi-Fi Connect-Info implementations

Implementation #1: CONNECT 11.00 Mbps 802.11b

Implementation #2: CONNECT 54.00 Mbps 802.11g

Implementation #3: CONNECT 11.00 Mbps 802.11b

Implementation #4: CONNECT 0Mbps 802.11b

Implementation #5: CONNECT 54.00 Mbps / 802.11ax / RSSI: 41 / Channel : 144

Opportunity to define a syntax for Connect-Info string that encompasses current implementations while supporting new optional key value pairs that address new requirements.

ABNF Syntax that encompasses and extends current implementations

```
-----  
; Connect-Info RADIUS Attribute #77 Syntax  
-----  
  
connect-info-77 = "CONNECT" *SP connectAttribute  
                 *( DELIMITER connectAttribute )  
  
connectAttribute = (MAXSPEED " Mbps") / PHYRATE  
                  ; indication of maximum  
                  ; achievable data rate  
  
connectAttribute =/ "802.11" WIFIGEN          ; Wi-Fi 802.11 version  
  
-----  
; connectAttributes - NON-DEVICE/CLIENT RELATED.  
;  
; These key-value pairs MAY be included in the Connect-Info attribute  
; when the attribute is included in the Access-Request or  
; Accounting-Request message.  
-----  
  
connectAttribute =/ "Channel:" *SP CHANNUM    ; Wi-Fi channel number  
  
connectAttribute =/ "Band:" *SP ("2.4"/"5"/"6")  
                  ; the Wi-Fi band - used to  
                  ; differentiate between  
                  ; re-use of channel  
                  ; numbers in 6 GHz  
  
connectAttribute =/ "RSSI-min:" *SP SS       ; the absolute value of  
                  ; configured minimum RSSI  
                  ; in dBm on the WLAN  
                  ; Access Point
```

Connect-Info = "CONNECT 54.00 Mbps / 802.11n / Channel: 1 / RSSI: 53"

Connect-Info = "CONNECT 400.00 Mbps 802.11ac Channel:46 RSSI:50
RSSI-min:80"

Connect-Info = "CONNECT 400.00 Mbps 802.11ac Channel:46
RSSI:48(AVG-EXP8) RSSI-min:80 Noise:94"

Connect-Info = "CONNECT 400.00 Mbps 802.11ac Channel:46
RSSI:48(AVG-EXP8) RSSI-min:80 Noise:94(MED-LIN80S) ChanUtil:12(AVG-
LIN600S)"

Connect-Info = "CONNECT 400.00 Mbps 802.11ac Channel:46
RSSI:56(AVG-EXP8) RSSI-min:80 Noise:90(MED-LIN80S) ChanUtil:15(AVG-
LIN300S) TxBitRate:150.0 RxBitRate:150.0"

Connect-Info = "CONNECT 400.00 Mbps 802.11ac Channel:46 Band:5
RSSI:56(AVG-EXP8) RSSI-min:80 Noise:90(MED-LIN80S) ChanUtil:15(AVG-
LIN300S) TxBitRate:150.0 RxBitRate:150.0 FrameLoss:3 FrameRetry:6"

Connect-Info = "CONNECT MaxRate MCS11-2SS / 802.11ax / Channel:37 /
Band:6 / RSSI:43(AVG-EXP8) / Noise:50 / ChanUtil:2(AVG-LIN5S)"

Connect-Info = "CONNECT 400.00 Mbps 802.11ac Channel:46
RSSI:48(AVG-EXP8) RSSI-min:80 Noise:94 SomeHistogramExtension:

[0 1 3 6 7]"

Changes Since draft-00

- Added extensibility to ABNF and corrected syntax.
 - `connectAttribute =/ 1*NO-DELIM-COLON ":" *SP 1*NO-DELIM-COLON ;` Syntax permitting extensibility
- Added security considerations section.
 - This document describes a syntax that enables a RADIUS client to provide a RADIUS server information pertaining to the operation of an IEEE 802.11 wireless network. The terms agreed between the operator of the RADIUS client and the operator of the RADIUS server SHOULD include restrictions on the use of such non-personal information by the operator of the RADIUS server.
- Added note on TxBitRate/RxBitRate when included in Accounting-Request type Stop.
 - Note, values of TxBitRate and RxBitRate MAY indicate values of 0 Mbps when included in Accounting-Request message with Acct-Status-Type value of Stop.

Radext email discussion since draft-00

Use of complex data structures

RFC 6929 suggests that adding complex data structures in one attribute is a bad idea.

I think we can make some exception here, as Connect-Info predates 6929, and already was a free-form text field.

Defining changing values

What concerns me is that the document suggests that the value of Connect-Info **changes** for each packet. i.e. it's not a statement of the connection status at the session start.

Attribute Encoding

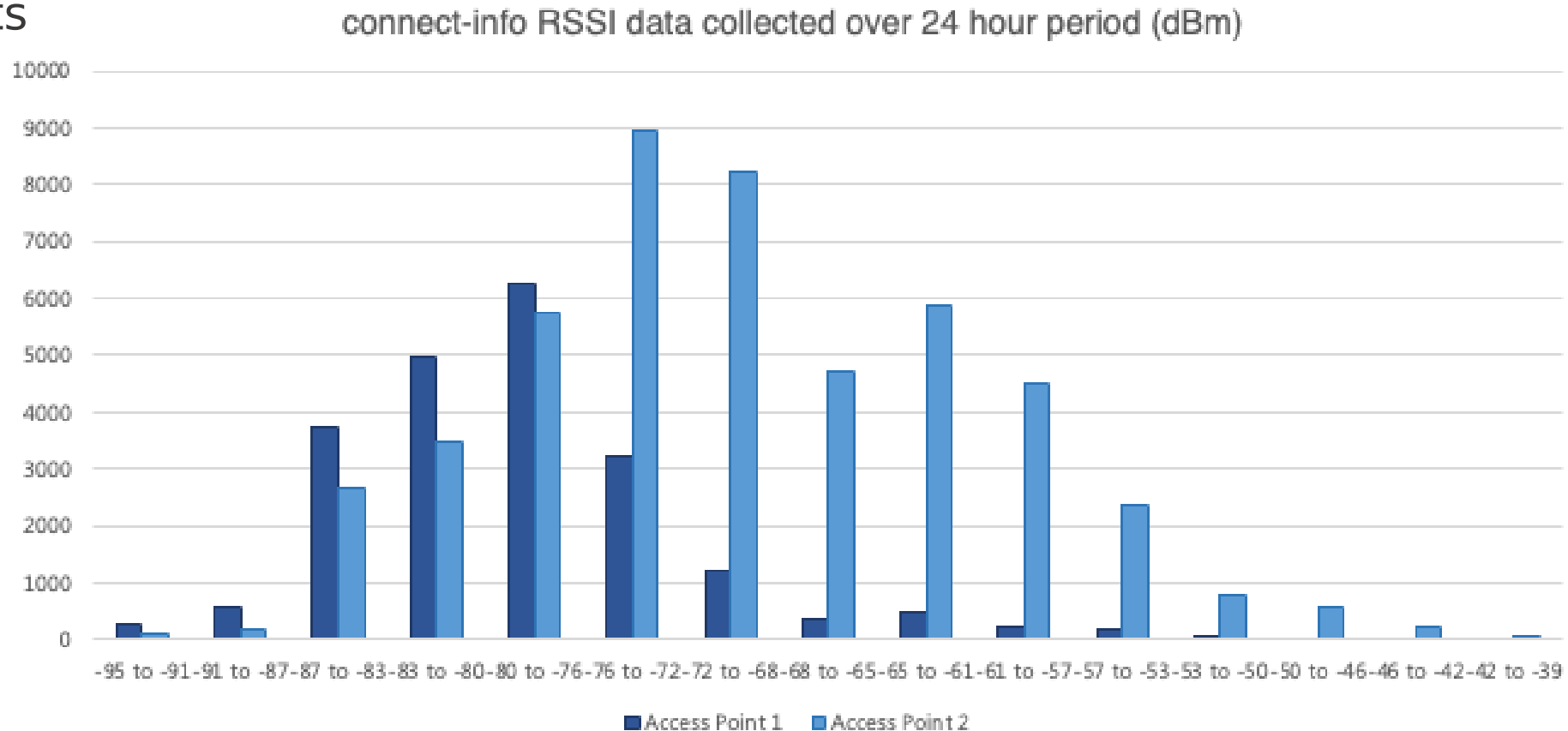
Why not just define a series of attributes, one for each field? That wouldn't take up much more space, and would likely be easier to parse.

Why not use existing YANG definitions and carry YANG-CBOR/XML/DER in RADIUS – with a pointer to ietf-interfaces

```
+--rw interface* [name]
  +--rw name                string
  +--rw description?        string
  +--rw type                 identityref
  +--rw enabled?            boolean
  +--rw link-up-down-trap-enable? enumeration {if-mib}?
  +--ro admin-status        enumeration {if-mib}?
  +--ro oper-status         enumeration
  +--ro last-change?        yang:date-and-time
  +--ro if-index            int32 {if-mib}?
  +--ro phys-address?       yang:phys-address
  +--ro higher-layer-if*    interface-ref
  +--ro lower-layer-if*    interface-ref
  +--ro speed?              yang:gauge64
```

Demonstrations since draft-00

- Helium have implemented Connect-Info draft-00 using OpenWi-Fi/OpenWRT and in December 2024 deployed across fleet of 17,000 Helium operated Wi-Fi Access points



Next Steps

- Notwithstanding comments over radext email list, would like feedback on whether radext can adopt such a draft.
- Imagine timeline for progressing draft can accommodate current radext priorities.