        CAPWAP Extension for 802.11n and Power/channel Autoconfiguration
                    draft-ietf-opsawg-capwap-extension-04

Abstract

   The CAPWAP binding for 802.11 is specified by RFC5416 and it was
   based on IEEE 802-11.2007 standard. Several new amendments of 802.11
   have been published since RFC5416 was published in 2009. 802.11n is
   one of those amendments and it has been widely used in real
   deployment. This document extends the CAPWAP binding for 802.11 to
   support 802.11n and also defines a power and channel auto
   configuration extension.

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   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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Table of Contents

1. Introduction

The 802.11-2009 [IEEE 802.11n.2009] standard was published in 2009 as
an amendment to the IEEE 802.11-2007 standard to improve network
throughput. The maximum data rate increases to 600Mbps. In the
physical layer, 802.11n uses Orthogonal Frequency Division
Multiplexing (OFDM) and Multiple Input/Multiple Output (MIMO) to
achieve the high throughput. 802.11n uses multiple antennas to form
an antenna array which can be dynamically adjusted to improve the
signal strength and extend the coverage.

Capabilities of 802.11n such as radio capability, radio configuration
and station information need to be supported by CAPWAP control
messages. The necessary extensions for this purpose are introduced
in Section 3 and specified in Section 4.

For IEEE 802.11 in general, it is desirable to be able to support
power and channel auto reconfiguration. Extensions for this purpose
are specified in Section 5.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL","SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in [RFC2119].

This document uses the following abbreviations:

    AC Access Controller
    A-MSDU Aggregate MAC Service Data Unit
    A-MPDU Aggregate MAC Protocol Data Unit
    AC Access Controller
    GI Guard Interval
    MCS Maximum Modulation and Coding Scheme
    MIMO Multiple Input/Multiple Output
    MPDU MAC Protocol Data Unit
    MSDU MAC Service Data Unit
    OFDM Orthogonal Frequency Division Multiplexing
    TSF timing synchronization function
    WTP Wireless Termination Point

3. CAPWAP 802.11n Support

802.11n supports three modes of channel usage: 20MHz mode, 40MHz mode
and mixed mode. 802.11n has a new feature called channel binding. It
can bind two adjacent 20MHz channel to one 40MHz channel to improve
the throughput.If using 40MHz channel configuration there will be
only one non-overlapping channel in the 2.4GHz band. In the large
scale deployment scenario, the operator needs to use 20MHz channel
configuration in the 2.4GHz band to allow more non-overlapping
channels.

In the MAC layer, a new feature of 802.11n is Short Guard
Interval(GI). 802.11a/g uses an 800ns guard interval between the
adjacent information symbols. In 802.11n, the GI can be configured
to 400nm under good wireless conditions.

Another feature in the 802.11 MAC layer is Block ACK. 802.11n can use
one ACK frame to acknowledge several MAC Protocol Data Unit (MPDU)
receiving events.

CAPWAP needs to be extended to support the above new 802.11n
features. CAPWAP should allow the access controller to know the
supported 802.11n features and the access controller should be able

to configure the different channel binding modes. This document
defines extensions of the CAPWAP 802.11 binding to support 802.11n
features.

3.1. CAPWAP Extension for 802.11n Support

Three 802.11n features need to be supported by CAPWAP 802.11 binding:
802.11n radio capability, 802.11n radio configuration and station
information. This section defines the extension of the current
CAPWAP 802.11 binding to support the 802.11n features.

3.1.1. 802.11n Radio Capability Information

[RFC5416] defines the IEEE 802.11 binding for the CAPWAP protocol.
It defines the IEEE 802.11 Information Element, which is used to
communicate any information element (IE) defined in the IEEE 802.11
protocol. This document specifies that the IEEE 802.11 Information
Element defined in section 6.6 of [RFC5416] SHALL be used to
transport the IEEE 802.11 HT information element defined in section
8.4.2.58 of [IEEE-802.11.2012]. The HT IE MAY in this way be
included in CAPWAP Configuration Status Request/Response messages.

3.1.2. 802.11n Radio Configuration Message Element

The 802.11n Radio Configuration message element is used by the AC to
provide IEEE 802.11n-specific configuration for a Radio on the WTP,
and by the WTP to deliver its radio configuration to the AC. This
supplements the IEEE 802.11 WTP WLAN Radio Configuration message
element defined in [RFC5416]. The format of the 802.11n Radio
Configuration message element is shown in Figure 1. The 802.11n
Radio Configuration message element MAY be included in the CAPWAP
Configuration Update Request/Response message.

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Radio ID   |S|P|N|G|B|      |   MaxSup MCS | Max MandMCS   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   TxAntenna   |   RxAntenna   |          Reserved             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
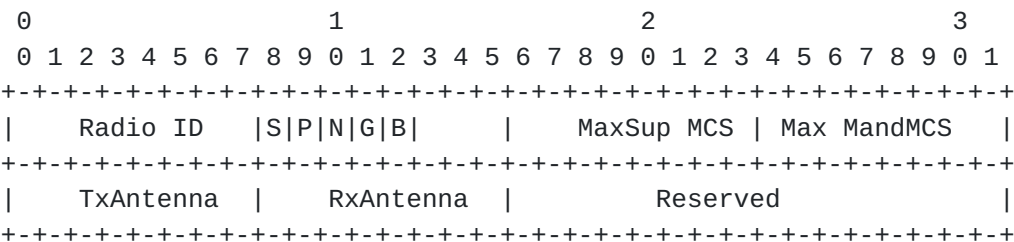
Figure 1: 802.11n Radio Configuration Message Element

Type: TBD1 for 802.11n Radio Configuration Message Element.

Length: 16.

Radio ID: An 8-bit value representing the radio, whose value is
between one (1) and 31.

S bit: A-MSDU configuration: Enable/disable Aggregate MAC Service
Data Unit (A-MSDU). Set to 0 if disabled. Set to 1 if enabled.

P bit: A-MPDU configuration: Enable/disable Aggregate MAC Protocol
Data Unit (A-MPDU). Set to 0 if disabled. Set to 1 if enabled.

N bit: 11n Only configuration: Whether to allow only 11n user access.
Set to 0 if non-802.11n user access is allowed. Set to 1 if
non-802.11n user access is not allowed.

G bit: Short GI configuration: Set to 0 if Short Guard Interval is
disabled. Set to 1 if enabled.

B bit: Bandwidth binding mode configuration: Set to 0 if 40MHz
binding mode. Set to 1 if 20MHz binding mode.

Maximum supported MCS: Maximum Modulation and Coding Scheme (MCS)
index. It indicates the maximum MCS index that the WTP or the STA
can support.

Max Mandatory MCS: Maximum Mandatory Modulation and Coding Scheme
(MCS) index. Mandatory rates must be supported by the WTP and the
STA that want to associate with the WTP.

TxAntenna: Transmitting antenna configuration. Each TxAntenna bit
represents a certain number of antennas. Set to 1 if enabled, set to
0 if disabled.

RxAntenna: Receiving antenna configuration. Each RxAntenna bit
represents a certain number of antennas. Set to 1 if enabled, set to
0 if disabled.

The detail definition of TxAntenna/RxAntenna is as follows:

```
                 0 1 2 3 4 5 6 7
                +-+-+-+-+-+-+-+-+
                |8|7|6|5|4|3|2|1|
                +-+-+-+-+-+-+-+-+
```

Figure 2: Definition of TxAntenna/RxAntenna

Each bit when enabled will represent the number of antennas
correspondent to that bit. Only one bit is allowed to be set to 1.
For example, when the first bit is enabled,it represents 8 antennas.

3.1.3. 802.11n Station Information

The 802.11n Station Information message element is used to deliver
IEEE 802.11n station policy from the AC to the WTP. The definition
of the 802.11n Station Information message element is in figure 3.
The format of 802.11n Station Information MAY be included in the
CAPWAP Station Configuration Request message.

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         MAC Address                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          MAC Address        |S| P |T|F|H|M| |  Max RxFactor  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Min StaSpacing|       HiSuppDataRate        | AMPDUBufSize   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| AMPDUBufSize  |    HtcSupp    |          MCS Set              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    MCS Set                                                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    MCS Set                                                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
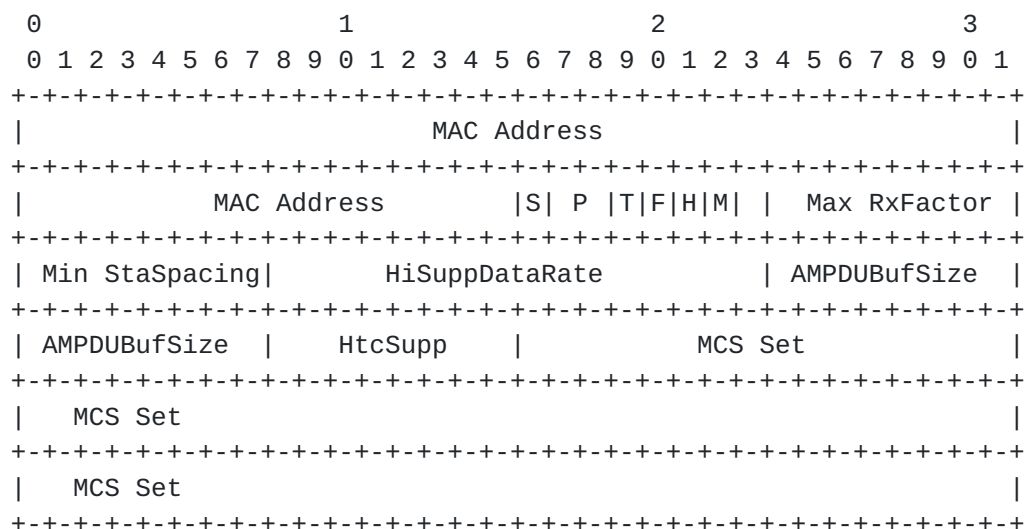
Figure 3: 802.11n Station Information

MAC Address: The station's MAC Address.

Type: TBD2 for 802.11 Station Information.

Length: 24.

S bit: Supporting bandwidth mode. 0x00: 20MHz bandwidth mode. 0x01:
40MHz bandwidth binding mode.

P flag: Power Saving mode: 0x00: Static. 0x01: Dynamic. 0x03: Do
not support power saving mode.

T bit: Whether to support short GI in 20MHz bandwidth mode. 0x00: Do
not support short GI. 0x01: Support short GI.

F bit: ShortGi40: Whether to support short GI in 40MHz bandwidth
mode. 0x00: Do not support short GI. 0x01: Support short GI.

H bit: Whether Block Ack supports delay mode. 0x00: Do not support
delay mode. 0x01: Support delay mode.

M bit: The maximal A-MSDU length. 0x00: 3839 bytes. 0x01: 7935
bytes.

Max RxFactor: The maximal receiving A-MPDU factor.

Min StaSpacing: Minimum MPDU Start Spacing.

HiSuppDataRate: Maximal transmission speed (Mbps).

AMPDUBufSize: A-MPDU buffer size (Byte).

HtcSupp: Whether to place HT headers on the packets forwarded from
this station.

MCS Set: The MCS bitmap that the station supports.

4. Power and Channel Autoconfiguration

Power and channel autoconfiguration could avoid potential radio
interference and improve the WLAN performance. In general, the auto-
configuration of radio power and channel could occur at two stages:
when the WTP power on or during the WTP running time.

4.1. Channel Autoconfiguration When WTP Power On

Power and channel auto reconfiguration avoids potential radio
interference and improves the WLAN performance. In general, the
auto- configuration of radio power and channel can occur at two
stages: when the WTP powers on or while the WTP is in running state.
When the WTP is powered-on, it needs to configure a proper channel.
IEEE 802.11 Direct Sequence Control elements or IEEE 802.11 OFDM
Control element defined in RFC5416 SHOULD be carried in the Configure
Status Response message to offer WTP a channel at this stage. If the
channel field of those information element is set to 0, the WTP will
need to determine its channel by itself, otherwise the WTP SHOULD be
configured according to the provided information element.

When the WTP determines its own channel configuration, it should
first scan the channel information, then determine which channel it
will work on and form a channel quality scan report. As shown in
Figure 3, the AC can control the scanning process by sending the IEEE
802.11 Scan Parameters message element defined in Section 5.1 to the

WTP in a Configure Status Response message or in a WTP Configure
Update Request message. The WTP will send the channel quality report
to the AC using the WTP Event Request message.

AC will determine whether to change the channel configuration based
on the received channel quality report. The AC MAY use a IEEE 802.11
Direct Sequence Control or IEEE 802.11 OFDM Control message element
carried by the configure Update Request message to configure a new
channel for the WTP.

4.2. Power Configuration When WTP Power On

The IEEE 802.11 Tx Power message element defined in section 6.18 of
[RFC5416] is used by the AC to control the transmission power of the
WTP. The 802.11 Tx Power information element is carried in the
Configure Status Response message or in the Configure Update Request
message.

4.3. Channel/Power Auto Adjustment

The Channel Scan Procedure is illustrated by the figure 4.


```
              WTP                Configure Status Req             AC
              ---------------------------------------------------------->
      Configure Status Res(Scan Parameter Message Element, Channel Bind Message
Element)
                 <---------------------------------------------------
              or

              WTP                                                 AC
      Configure Update Req(Scan Parameter Message Element, Channel Bind Message
Element )
                 <---------------------------------------------------
                              Configure Update Res
                 --------------------------------------------------->
```
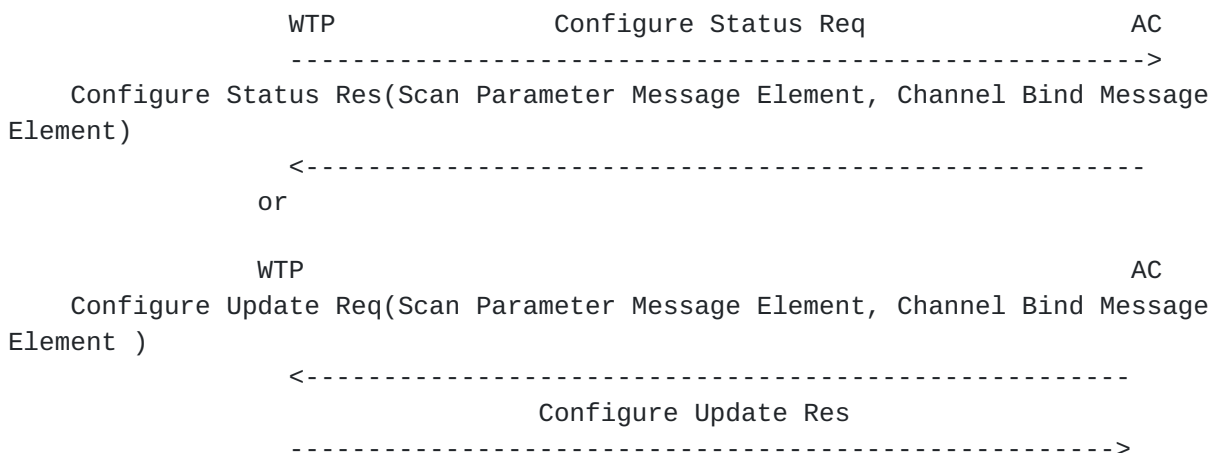

Figure 4: Channel Scan Procedure

The WTP has two work modes: normal mode and scan only mode. In
normal mode, the WTP can provide service for station access and scan
channels at the same time. Whether the WTP will scan a given set of
channels is determined by the Max Cycles field in the IEEE 802.11
Channel Bind message element defined in Section 5.2. When this field
is set to 0, the WTP will not scan the channel. If this field is set
to 255, the WTP will scan the channel continuously. The type of the
scan is determined by the Scan Type field. With the passive scan

type, the WTP monitors the air interface, using the received beacon

frames to determine the nearby WTPs. With the active scan type, the
WTP will send a probe message and receive probe response messages.

In the normal scan mode, the WTP behaviour is controlled by three
parameters: PrimeChlSrvTime, OnChannelScanTIme, and
OffChannelScnTIme. These are provided by the IEEE 802.11 Scan
Parameters message element defined in Section 5.1. The WTP will
provide access service for stations for the duration given by
PrimeChlSrvTime. It then scans the working channel for the duration
given by OnChannelScnTime. It returns to servicing station access
requests on the working channel for another period of length
PrimeChlSrvTime, then moves to a different channel and scans it for
duration OffChannelScnTIme. It repeats this cycle, scanning a new
non-working channel each time, until all the channels have been
scanned.

When the WTP works in scan only mode, it does not distinguish between
the working channel and scan channel. Every channel's scan duration
will be OffChannelScnTime and PrimeChlSrvTime and OnChannelScanTime
MUST be set to 0.

As shown in Figure 4, the AC can control the scan behaviour at the
WTP by including the IEEE 802.11 Scan Parameters and IEEE 802.11
Channel Bind message elements in a Configure Status Response or WTP
Configure Update Request message.

Scan Report. After completing its scan, the WTP MAY send the scan
report to the AC using a WTP Event Request message. The scan report
information is carried in the IEEE 802.11 Channel Scan Report message
element (Section 5.3) and an instance of the IEEE 802.11 Information
Element message element carrying a copy of theIEEE 802.11 Neighbor
WTP Report information element (Section 5.4).

4.3.1. IEEE 802.11 Scan Parameters Message Element

The format of the IEEE 802.11 Scan Parameters Message Element is as
shown in Figure 5:

```
               0                   1                   2                   3
               0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
              +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
              |     Radio ID    |M|S|L|D|         |          Report Time      |
              +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
              |       PrimeChlSrvTime         |      On Channel ScanTime      |
              +-------------------------------+-------------------------------+
              |   Off Channel ScanTime        |
              +-------------------------------+
```

Figure 5: IEEE 802.11 Scan Parameters Message Element

Type: TBD3 for IEEE 802.11 Scan Parameters Message Element.

Length: 10.

Radio ID: An 8-bit value representing the radio, whose value is
between one (1) and 31.

M bit: Work mode of the WTP. 0:normal mode. 1: monitor only mode, no
service is provided in this mode.

S bit: Scan Type: 0: active scan; 1: passive scan.

L bit: L=1: Open Load Balance Scan. L=0: Disable Load Balance Scan.

D bit: D=1: Open Rogue WTP detection scan. D=0: Disable Rouge WTP
detection scan.

Report Time: Channel quality report time (unit: second).

PrimeChlSrvTime: Service time (unit: millisecond) on the working scan
channel. This segment is invalid(set to 0) when WTP oper mode is set
to 1. The maximum value of this segment is 10000, the minimum value
of this segment is 5000, the default value is 5000.

On Channel ScanTime: The scan time (unit: millisecond) of the working
channel. When the WTP oper mode is set to 2, this segment is
invalid(set to 0). The maximum value of this segment is 120, the
minimum value of this segment is 60, the default value is 60.

Off Channel ScanTime: The scan time (unit: millisecond) of the
working channel. When the WTP operating mode is set to 2, this
segment MUST be set to 0. The maximum value of this segment is 120,
the minimum value of this segment is 60, the default value is 60.

4.3.2. IEEE 802.11 Channel Bind Message Element

The format of the IEEE 802.11 Channel Bind Message Element is as
follows:

```
            0                   1                   2                   3
            0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
           |   Flag        |   Max Cycles  |Channel Count  |ScanChannelSet.|
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
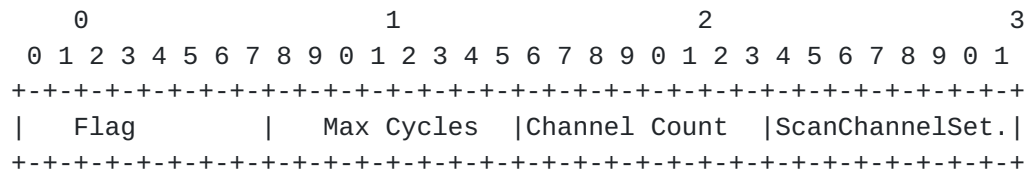
Figure 6: IEEE 802.11 Channel Bind Message Element

Type: TBD4 for IEEE 802.11 Channel Bind Message Element.

Length: 4.

Radio ID: An 8-bit value representing the radio, whose value is
between one (1) and 31.

Flag: bitmap, reserved.

Max Cycles: Number of times the scanning cycle is repeated for the
set of channels identified by this message element. 255 means
continuous scan.

Channel Count: The number of channels will be scanned.

Scan Channel Set: identifies the members of the set of channels to
which this message element instance applies. The format for each
channel is as follows:

```
            0                   1                   2                   3
            0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
           |            Channel ID         |             Flag              |
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
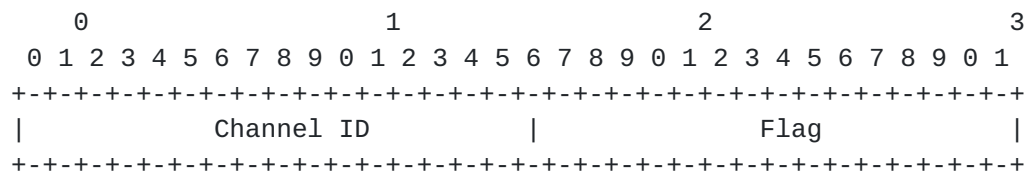
Figure 7: Channel Information Format

Channel ID: the channel ID of the channel which will be scanned.

Flag: Bitmap, reserved for future use.

4.3.3. **IEEE 802.11 Channel Scan Report**

   There are two types of scan report: Channel Scan Report and Neighbor
   STA Report. Channel Scan Report is used to channel autoconfiguration
   while Neighbor WTP Report is used to power autoconfiguration. The
   WTP send the scan report to the AC through WTP Event Request message.
   The information element that used to carry the scan report is Channel
   Scan Report Message Element and Neighbor WTP Report Message Element.

   The format of the IEEE 802.11 Channel Scan Report message element is
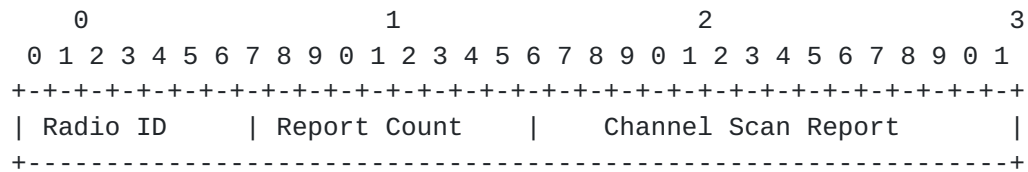   in Figure 8.

```
                    0                   1                   2                   3
                    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
                   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                   | Radio ID    | Report Count    |    Channel Scan Report      |
                   +-------------------------------------------------------------+
```

   Figure 8: IEEE 802.11 Channel Scan Report Message Element

   Type: TBD5 for IEEE 802.11 Channel Scan Report message element.

   Length: >=29.

   Radio ID: An 8-bit value representing the radio, whose value is
   between one (1) and 31.

   Report Count: The number of channels for which a report is provided.

   Channel Scan Report: The format of each Channel Scan Report is shown
   in Figure 9.

```
            0                   1                   2                   3
            0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
           |      Channel Number   |       Radar Statistics     | Mean    |
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
           |      Time    | Mean RSSI   | Screen Packet Count            |
           +---------------------------------------------------------------+
           | NeighborCount| Mean Noise  | Interference  |  WTP Tx Occp    |
           +---------------------------------------------------------------+
           | WTP Rx Occp  | Unknown Occp |  CRC Err Cnt  | Decrypt Err Cnt |
           +---------------------------------------------------------------+
           |Phy Err Cnt   | Retrans Cnt  |
           +----------------------------+
```

Figure 9: Channel Scan Report

Channel Number: The channel number.

Radar Statistics: Whether detect radar signal in this channel. 0x00:
detect radar signal. 0x01: no radar signal is detected.

Mean Time: Channel measurement duration (ms).

Mean RSSI: The average signal strength of the scanned channel (dbm).

Screen Packet Count: Received packet number.

Neighbor Count: The neighbor number of this channel.

Mean Noise: the average noise on this channel.

Interference: The interference of the channel, including STA
interference and WTP interference.

WTP Tx Occp: (The WTP sending duration time/Monitor time)*255.
The WTP sending duration time is the total sending time of
the WTP during the period of channel scan.

WTP Rx Occp: (The WTP receiving duration time/Monitor time)*255.
THe WTP receiving duration time is the total receiving time of
the WTP during the period of channel scan.

Unknown Occp: (All other packet transmission time duration/Monitor
time)*255.

CRC Err Cnt: CRC err packet number.

   Decrypt Err Cnt: Decryption err packet number.

   Phy Err Cnt: Physical err packet number.

   Retrans Cnt: Retransmission packet number.
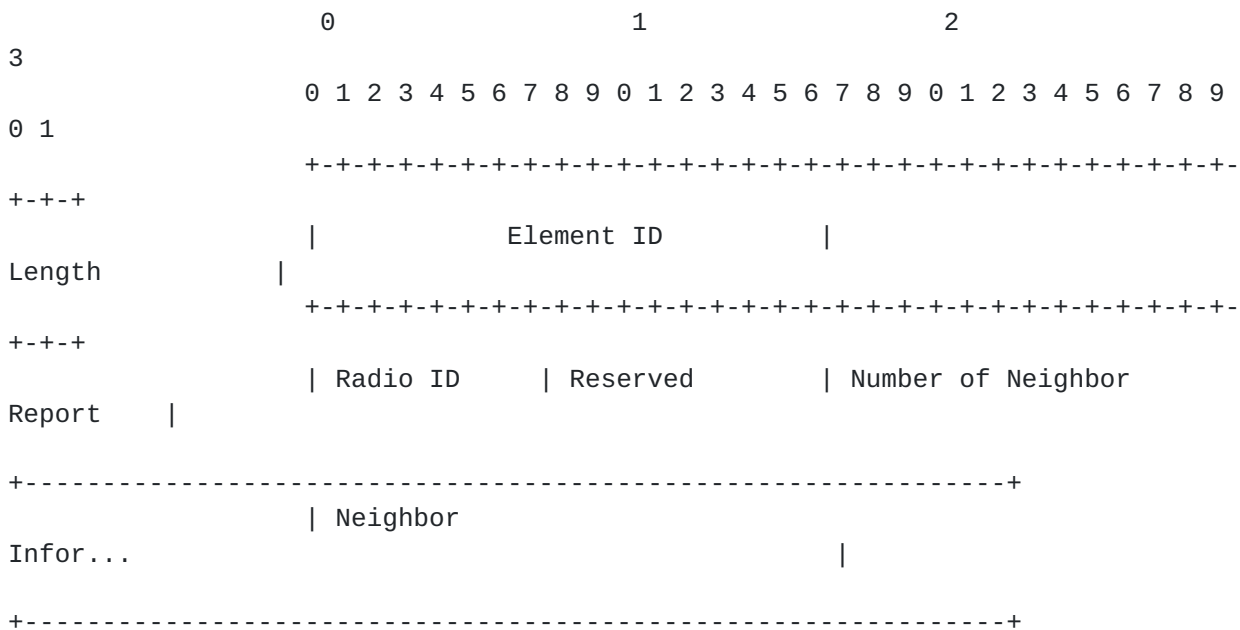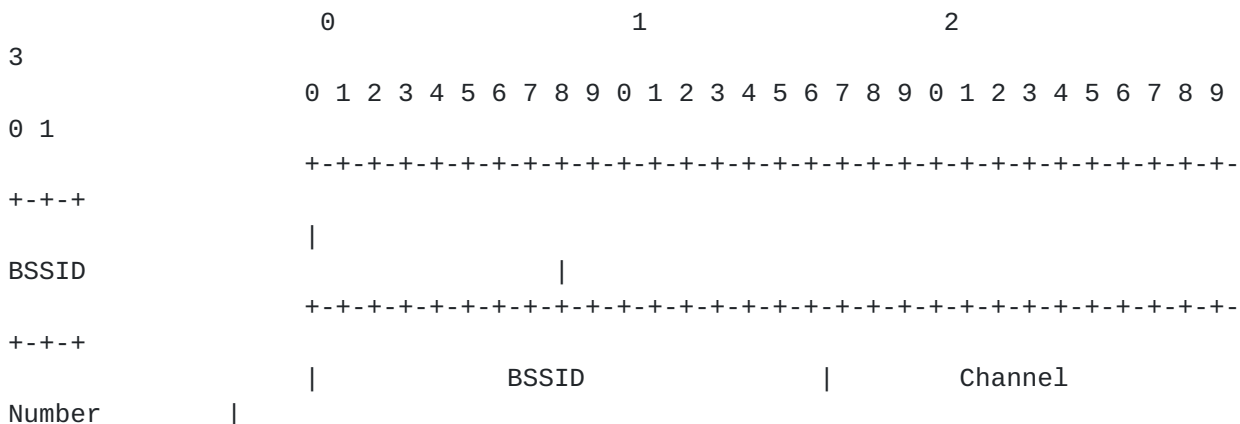
4.3.4. IEEE 802.11 WTP Neighbor Report

```
                    0                   1                   2
3
                    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
0 1
                   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
+-+-+
                   |              Element ID          |
Length            |
                   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
+-+-+
                   | Radio ID     | Reserved         | Number of Neighbor
Report    |
+----------------------------------------------------------------+
                   | Neighbor
Infor...                                                          |
+----------------------------------------------------------------+
```

   Figure 10: WTP Neighbor Report TLV

   The definition of Neighbor info is as follows:

```
                    0                   1                   2
3
                    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
0 1
                   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
+-+-+
                   |
BSSID                             |
                   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
+-+-+
                   |             BSSID               |         Channel
Number        |
```

```
           +---------------------------------------------------------------+
                      | 2nd Offset    | Mean RSSI      | Sta Intf      |     AP
           Intf     |

           +---------------------------------------------------------------+
```

Figure 11: Neighbor info

BSSID: The BSSID of this neighbor WTP.

Channel Number: The channel number of this WTP neighbor.

2nd channel offset: The auxiliary channel offset of this WTP.

Mean RSSI: The average signal strength of this WTP (dbm).

Sta Intf: (The station air interface occupation time/Monitor
time)*255. The station air interface occupation time is the
air interface occupation time caused by the stations which are connected
to this WTP.

AP Intf: (The WTP air interface occupation time/Monitor time)*255.
The WTP air interface occupation time is the air interface occupation
time caused by the WTP.

5. Security Considerations

This document is based on RFC5415/RFC5416 and adds no new security
considerations.

6. IANA Considerations

The extension defined in this document need to extend CAPWAP IEEE
802.11 binding message element which is defined in section 6 of
[RFC5416]. The following IEEE 802.11 specific message element type
need to be defined by IANA.

TBD1: 802.11n Radio Configuration Message Element type value
described in section 4.1.2.

TBD2: 802.11n Station Message Element type value described in section
4.1.3.

TBD3: 802.11 Scan Parameter Message Element type value described in
section 5.3.1.

TBD4: 802.11 Channel Bind Message Element type value described in
section 5.3.2.

TBD5: Channel Scan Report Message Element type value described in
section 5.3.3.

7. Contributors

This draft is a joint effort from the following contributors:

Gang Chen: China Mobile chengang@chinamobile.com

Naibao Zhou: China Mobile zhounaibao@chinamobile.com

Chunju Shao: China Mobile shaochunju@chinamobile.com

Hao Wang: Huawei3Come hwang@h3c.com

Yakun Liu: AUTELAN liuyk@autelan.com

Xiaobo Zhang: GBCOM

Xiaolong Yu: Ruijie Networks

Song zhao: ZhiDaKang Communications

Yiwen Mo: ZhongTai Networks

Dorothy Stanley: dstanley1389@gmail.com

Tom Taylor: tom.taylor.stds@gmail.com

8. Acknowledgements

9. Normative References

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          systems Local and metropolitan area networks - Specific
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          "IEEE Standard for Information technology -
          Telecommunications and information exchange between
          systems Local and metropolitan area networks - Specific
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Authors' Addresses

    Yifan Chen
    China Mobile
    No.32 Xuanwumen West Street
    Beijing 100053
    China

    Email: chenyifan@chinamobile.com

    Dapeng Liu
    China Mobile
    No.32 Xuanwumen West Street
    Beijing 100053
    China

    Email: liudapeng@chinamobile.com

    Hui Deng
    China Mobile
    No.32 Xuanwumen West Street
    Beijing 100053
    China

    Email: denghui@chinamobile.com

    Lei Zhu
    Huawei
    No. 156, Shi-Chuang-Ke-Ji-Shi-Fan-Yuan Beiqing Road, Haidian District
    Beijing 100095
    China

    Email: lei.zhu@huawei.com