小AC的capwap框架设计及消息定义

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编制历史

|  |  |  |
| --- | --- | --- |
| 编制人 | 编制时间 | 编制事项 |
| 夏亮、李锦富 | 140611 | 1、定义了capwap私有协议框架  2、定义了php、capwapd、capwapc之间的消息格式 |
| 夏亮 | 140612 | 支持nat应用场景 |
| 夏亮 | 140731 | 扩充了echo resp消息，使元素严格包含subid和subid\_len |
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## 概述

rfc5415、rfc5416和《移动互通协议分册》所定义的capwap协议流程复杂、消息协议格式混乱且大多还用不着。所以本文将简化capwap设计，提高开发效率及后期代码维护工作量。本文将大致给出capwapd通信流程图、capwapc大致的状态机转换图、详细的capwap通信消息定义。

注：本文只涉及到capwap控制类消息，数据类消息未涉及。

## capwapd交互图

capwapd主要和capwapc，端口号分别为UDP5246，未来可扩展合入定位上报的消息。Capwapd交互图如下：



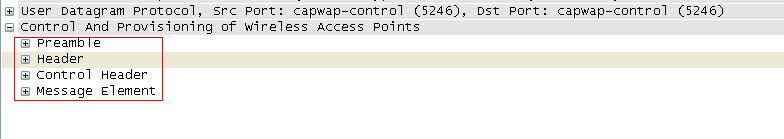
control header都遵循capwap协议，由于标准协议和移动文档在control header中，所定义的meassge element 元素复杂，元素号不连续，且唯一，不同control header中id号不能复用，且多出不必要的字段和通信过程，更重要的是，ap似乎无法穿越nat，内网ap无法与外网的ac交互。

所以在此基础上对原有capwap协议做了部分改造，尤其是配置下发，以及下发的方式上。

## capwapd与capwapc间的消息定义

### 3.1 capwap消息体概述

capwapd和capwapc都基于udp5246建立监听，udp后直接跟capwap消息体，一个完整的消息体大致如下：

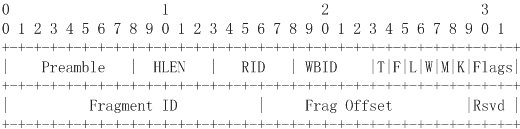


由preamble前导帧、capwap头、control header、message element组成。本文将在3.2中说明preamble前导帧、capwap头后，重点定义control header、message element的消息格式。

一般来说，在代码开发时，在填充完3.2节定义的消息头后，直接填充3.3节定义的control header和message element即可。

### 3.2 capwap消息头定义

preamble前导帧、capwap头遵照capwap协议定义，结构如下：



#### 3.2.1 CAPWAP协议前导头

CAPWAP协议前导头如图5-1所示，用于快速识别版本和报文分类。



Version: 4位数据，表示版本，本规范中固定为0。

Type: 4位数据，表示报文类型，支持的值如下:

1. 表示CAPWAP协议头为非加密
2. 表示CAPWAP协议头为DTLS加密

#### 3.2.2 capwap头

HLEN：表示CAPWAP协议头的长度（包括可选项），类似IP头长度定义，HLEN乘以4即CAPWAP协议头的真实长度（CAPWAP协议头是4字节对齐的）。

RID：5位数据，表示Radio ID，用于指出报文是与哪个Radio关联，便于AP预处理；0<=RID<=31，数据报文填写Radio编号，控制报文填写0，保活数据报文填写0。

WBID：5位数据，表示Radio支持的无线技术，目前支持为如下值：

1 - IEEE 802.11

2 - 保留

3 - EPCGlobal

0 - 保留

T：为0表示payload是802.3帧，为1表示payload按照WBID指示。

F：为0表示报文未分片，为1表示报文是分片

L：当F位为1时，本标志位才有意义。为1表示报文为最后一个分片，反之则不是。

W：为1表示协议头中有“Wireless Specific Information（WLAN ID）”选项，反之则没有。当Tunnel mode为802.3隧道模式或者为802.11隧道模式时，下行CAPWAP数据报文，该选项必须携带。

M：为1表示协议头中有“Radio MAC Address（BSSID）”选项，反之则没有。当Tunnel mode为802.3隧道模式时，上行封装802.3报文的CAPWAP数据报文必须携带。其他情况下，则不必要携带该选项。

K：为1表示当前报文为数据隧道的保活（keep-alive）报文，反之则不是。

Flags：保留，必须为0。

Fragment ID：分片ID，用于分片报文重组。

Fragment Offset：当F位为1是本字段有意义，表示分片报文偏移，类似IP报文分片偏移,本字段乘以8为真实偏移。

Reserved：保留，必须为0。

### 3.3 control header和message element定义

Control header定义大致如下图前8个字节，其后续可跟多个message element元素：



|  |  |
| --- | --- |
| CAPWAP Control header Message | Message Type Value |
| Join Request | 3 |
| Join Response | 4 |
| Configuration Update Request | 7 |
| Configuration Update Response | 8 |
| AP Event Request | 9 |
| AP Event Response | 10 |
| Echo Request | 13 |
| Echo Response | 14 |
| Reset Request | 17 |
| Reset Response | 18 |
| Station Configuration Request | 25 |
| Station Configuration Response | 26 |

Seq Num：Sequence Number，对于需要重传的CAPWAP控制报文（除Echo报文外），每发送一个新的报文时序列号依次递增。Response报文的Seq Num应与对应的Request报文的序列号相同。为避免出现乱序，CAPWAP的控制报文的发送和接收的序列号窗口大小为1。即在上一个Request报文，未收到Response时，不应发送下一个Request报文。下一个Request报文，应在发送队列中等待，直到上一个Request得到回应之后，才能进行发送。AP第一次上线时，控制报文序列号从1开始，依次递增。

Msg Element Length：为flag后的报文长度（参见RFC 5415 4.5.1.3.节的说明）。

以下将对每条Message Type控制消息报文的发送、接收过程进行详细描述，并定义每条控制消息所携带的message element消息元素。对于每条控制消息中不在列表内的标准消息元素，则做忽略处理，本规范只校验必须携带的消息元素。

#### 3.3.1 Join Request

1. **描述**

Msg type=3，Capwapc发至capwapd，ap发送的加入请求，在ac核对报文内的版本信息后，给予是否允许加入的回应。

1. **携带的msg element报文格式**
2. AP board data消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| ID = 38 | len |

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| Vendor Identifier （int） |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| sub type | sub len |

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| value …. |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

ID: 38 ,int格式

Len: 本消息元素的长度，int格式

Vendor Identifier:企业码，国人为整型18603

Sub type:

1. AP Model Number，记录AP型号，必选，char格式。
2. AP Serial Number：记录AP序列号，可选，char格式。
3. Board ID：厂商名，char型，必选，长度不超过32字节。
4. Board Revision：记录AP硬件版本号，必选，长度不超过32字节。
5. Base MAC：系统MAC，记录AP的MAC地址，必选，int格式，形如0x00 0x11 0xb5 0x12 0x34 0x56
6. Software\_ver：软件版本号，为大版本加小版本号
7. Local IPv4消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| ID = 30 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| IP 地址 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

ID: 30 ,int格式

Len: 本消息元素的长度，int格式

Ip：ap的ip地址

1. **发送时机**
2. 当ap启动获知AC地址后，向AC发送join请求
3. 当ap的保活报文丢失，在多次尝试保活失败后，重新发送join请求
4. 在多次发送jion请求，ap应考虑重新启动

#### 3.3.2 Join Response

1. **描述**

Msg type=4，Capwapd发至capwapc，ac核对ap的jion请求报文内的版本信息后，给予是否允许加入的回应，如果拒绝，则附上原因码

1. **携带的msg element报文格式**
2. Result code消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 33 | len |

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| value …. |

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ID: 33 ,int格式

Len: 本消息元素的长度，int格式

Result Code:

1. 成功
2. Join失败，ap信息有误，不识别
3. **发送时机**

每次ap向AC发出join请求时，ac的capwapd都要以此消息回应。

#### 3.3.3 Station Configuration Request

1. **描述**

Msg type=25，Capwapc发至capwapd，包括用户上、下线上报等

1. **携带的msg element报文格式**
2. 厂商特征消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 37 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| Vendor Identifier |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| element id = 0 | ap mac

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| ap mac |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

ID: 37 ,int格式

Len: 本消息元素的长度，int格式

Vendor Identifier：企业码

element id:自定义元素id=0

ap mac:形如0x00 0x11 0xb5 0x01 0x02 0x03

1. Sta 上线消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| ID = 8 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| radio id | mac length | sta mac |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| sta mac |

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| radio\_channel | 保留 |

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

1. Sta 下线消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 18 | len |

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| radio id | mac length | sta mac |

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| sta mac |

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1. **发送时机**

用户上、下线时发送

#### 3.3.4 Station Configuration Response

1. **描述**

Msg type=26，Capwapd发至capwapc，ap事件上报后的回应消息，包括用户上、下线、snmp网管上报、环境扫描上报等的回应

1. **携带的msg element报文格式**
2. Result code消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| ID = 33 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| value |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

ID: 33 ,int格式

Len: 本消息元素的长度，short int格式

value:

1. 成功
2. 不是期望的消息，当前状态接收到非法消息.ap收到此消息，多半是因为ac设置了该用户的黑名单，拒绝为该用户服务，此时ap应kick此用户。且此时应携带以下元素：

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| ID = 18 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| radio id | mac length | sta mac |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| sta mac |

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1. **发送时机**

AC在收到Station Configuration Request事件后回应。

#### 3.3.5 Echo Request

1. **描述**

Msg type=13，Capwapc正式进入run工作状态后，周期性发送保活报文echo request至capwapd，capwapd以echo resp回应，每个保活报文携带自身ap的mac

1. **携带的msg element报文格式**
2. 厂商特征消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 37 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| Vendor Identifier |

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| element id = 0 | ap mac

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| ap mac |

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ID: 37 ,int格式

Len: 本消息元素的长度，int格式

Vendor Identifier：企业码

element id:自定义元素id=0

ap mac:形如0x00 0x11 0xb5 0x01 0x02 0x03

1. ap自身状态信息元素

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| ID = 4096 | len |

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| subid=1 | sub\_len | 心跳周期 | subid=2

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| sub\_len | 终端数 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

心跳周期： 1字节，告知AC自身的心跳周期0代表15秒钟，其余值代表分钟

终端数：1字节，告知ac，自身当前的关联终端总数

1. ap网管数据元素

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| ID = 4097 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| subid=1 | sub\_len | 保留 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| 有线收（单位MB） |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| 有线发（单位MB） |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| wifi收（单位MB） |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| wifi发（单位MB） |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| lte收（单位MB） |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| lte发（单位MB） |

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有线收：周期内，有线接收的数据变化值即增加值

….

lte发：周期内，lte卡发送的数据变化值即增加值

1. **发送时机**

capwapc保活报文在一段时间内断开后，应考虑进入join状态，再不通，最后至重启。Echo发送周期可配置，ap在多次没有收到回应时，转换自身状态。同样ac在多次没有收到echo request后，应将ap在线状态置为idle。

#### 3.3.6 Echo Response

1. **描述**

Msg type=14，Capwapd回应ap的保活报文，并检查ap info表中的，消息字段是否填充有效值，把对应的消息id提取出来，组成配置消息发送给capwapc.

1. **发送时机**
2. Ap加入时，Capwapd，对ap分组的配置标志位置位，等待下一个echorequest到来后，提取标志位，将各类配置封装在echo resp一并回复。capwapc保活报文在一段时间内断开后，capwapc应考虑进入join状态，再不通，最后至重启。Echo发送周期可配置，ap在多次没有收到回应时，转换自身状态。同样ac在多次没有收到echo request后，应将ap在线状态置为idle。
3. Ac正常工作时，页面下发配置，也会触发php置位ap分组中的配置标志位，在最近一次收到ap的echo request后，配置将随echo resp发至capwapc.
4. **携带的msg element报文格式如下**

##### 3.3.6.1 重置消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 4096 | len |

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| subid=1 | subid\_len | value |

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subid=1 :ap重置消息

subid\_len :value的长度

vaule :

1. 重启，后面的值无效
2. 恢复默认，后面的值无效

| subid = 2 | subid\_len | 升级对象 | 升级方式 |

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| 版本服务器ip |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| 用户名长度 | 用户名 。。。。。 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| 密码长度 | 下载密码 。。。。。。。。。 |

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| 版本全路径名长度 | 版本全路径名 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

subid =2：ap升级消息

subid\_len：升级元素的长度

升级对象：

1. 版本（默认）
2. 配置文件
3. Uboot
4. 补丁

升级方式：

1. ftp下载 （默认）
2. tftp下载
3. http下载

服务器ip：版本存放的服务器ip地址

用户名：下载时的用户名

下载密码：下载时的密码

版本全路径：服务器上的版本路径

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| subid=3 | subid\_len | 2.4 channel | 5.8channel |

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subid = 3：信道重置消息

subid\_len：信道元素的长度

2.4 channel：1-13

5.8channel：含5.18和5.8两个频段的所有信道值，0为关闭5.1G频段，1为打开5.1G频段，信道默认或自动

##### **3.3.6.2** wlan消息元素

数据库配置了多少个，消息就携带多少个ssid配置信息。

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 4097 | len |

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| wlan id =1 | subid\_len | 转发模式| |

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| 隐藏ssid | 最大用户数 | vlan id |

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| ssid的上行流控 KB | ssid的下行流控 kB |

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| 用户的上行流控 kB | 用户的下行流控 kB |

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| ssid长度 | ssid …….. |

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| 安全配置（依安全模式而定） |

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| 。。。。。。。。。。。。。。。。。。。。。。 |

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| wlan id =2 | subid\_len | 转发模式| |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| 。。。。。。。。。。。。。。。。。。。。。。 |

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ID: 4097 ,int格式

Len: 本消息元素的长度， int格式

Wlan id：1-8，表示wlan的id号

Subid\_len ：该wlanid的元素长度

转发模式：0-本地，1-集中

隐藏ssid：0-不隐藏，1-隐藏

最大用户数：0-255，0代表关闭

Vlan ：id：0-4095

Ssid上下行流控：0代表关闭，单位kB

用户上下行流控：0代表关闭，单位kB

Ssid长度：最大32

Ssid：ssid名

安全模式：0-open，1-psk2/psk,2-eap，3-wapi/psk，4-wapi证书

安全配置：

1. 安全模式为0时，后续无内容
2. 安全配置为1时，安全配置格式为：

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|安全模式=1 | 加密类型，0-tkip，1-aes | psk key len |

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| psk key ……….. |

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1. 安全模式为2时，安全配置的格式为：

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|安全模式=2 |加密类型，0-tkip，1-aes | auth server |

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| auth server | auth port |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| accounting server |

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| accounting port | radius key len |

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| radius key |

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1. Wapi相关的定义暂时搁置

##### 3.3.6.3 无线参数元素

一次性下发双频的配置，如果单频ap收到，则可不理会radio=2

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| ID = 4098 | len |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| Radio id=1 | r\_len |txpow | power周期 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

|信道带宽 | 无线模式 | short gi | ampdu | ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| amsdu | 空间流 | 低速率设置 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| Radio id =2 |R\_len | txpow | power周期 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

|信道带宽 | 无线模式 | short gi | ampdu |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| amsdu | 空间流 | 保留 |

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| becon帧间隔 | rts设置 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

| 自动信道调整开关| 信道调整方式 | 信道调整周期 |

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| 5.8G优先接入开关|弱信号禁止接入阀值| 5.2G频段开关|

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Radio: 1-31,一般1代表2.4，2代表5.8

R\_len: radio元素的长度

Txpow：0-8，

1. 代表自动功率调整
2. 1/8的功率，即12%的功率
3. 2/8的功率
4. 3/8的功率
5. 4/8的功率，即50%的功率
6. 5/8的功率
7. 6/8的功率
8. 7/8的功率
9. 8/8的功率,即100%的功率
10. 关闭射频

power周期：单位，小时，当txpow为0时该值才有效。

信道带宽：0代表ht20，1代表ht40（11ac的定义带宽方式 0：use the device settings.1:20Mhz.2:20/40Mhz.3:20/40/80Mhz）

无线模式：

1. 11b only
2. 11g only
3. 11n only
4. 11b/g
5. 11b/g/n
6. 11a only
7. 11a/n
8. 11g/n
9. 11ac only
10. 11ac/a

Short gi/ampdu/amsdu: 0代表关闭，1代表开启

空间流：1代表1\*1，3代表2\*2

低速率设置：

默认0x0fff，根据想关闭的速率值，按下表格屏蔽该值0到11位，得出的值下发给ap即可。A卡暂时不考虑。

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 配置值（高位->地位） | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 11bg | **54** | **48** | **36** | **24** | **18** | **12** | **9** | **6** | **11** | **5.5** | **2** | **1** |
| 11a |  |  |  |  | **54** | **48** | **36** | **24** | **18** | **12** | **9** | **6** |

Beacon帧间隔：100-1000,单位ms

Rts门限: 1-2346

自动信道调整：0代表关闭，1代表开启，为1时，ac对其固定信道设置是无效的。

信道调整方式：0代表启动时调整，1代表周期性调整

信道调整周期：5-1440，单位分钟，当调整方式为1时，该值有效

5.8G优先接入开关：0代表关闭，1代表打开

弱信号禁止接入阀值rssi：0—90，0为关闭

5.2G频段开关：0为关闭，1为开启

##### 3.3.6.4 功能参数元素

一次下发多个功能设置，ap不支持可不理会，后续功能复杂，应新增元素独立下发。

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 4099 | len |

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| subid=1 | subid\_len | 链路完整性开关|断开时ap的动作 |

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| keeplive\_period|上报周期倍数|事件开关（终端上下线）| |

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链路完整性开关：0代表关闭，1代表开启

断开时ap的动作：0代表关闭射频，1代表重启ap，2代表只关闭集中转发的ssid

保活时长：1个字节，单位分钟，值为0时，ap将默认以15秒保活。

上报周期倍数：保活时长乘以该值，将是ap作为统计数据上报的周期时间。

事件开关（终端上下线）：1个字节，0是关闭，1是打开

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| subid=2 | subid\_len | ntp开关 | ntp同步周期 |

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| ntp服务器ip |

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Ntp开关：0代表关闭，1代表开启

Ntp同步周期：0-255，单位小时

Ntp服务器ip：默认下发ac的地址。

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| subid=3 | subid\_len |定位上报开关| 定位上报周期 |

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定位上报：0代表关闭，1代表开启

定位上报周期：0-255，单位秒

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| subid=4 | subid\_len |ap重定向开关| 保留 |

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| url长度 | URL ................... |

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| 白名单长度 | 白名单ip列表 ................. |

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ap重定向开关：0代表关闭，1代表开启

url长度：2字节

URL :下发给ap，最终被设置在ip的dnat表中

白名单ip列表：多个ip间的用‘%’进行分隔

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| subid=5 | subid\_len |日志上报开关| 上报周期 （h） |

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Ap日志上报开关：0代表关闭，1代表开启

上报周期：单位小时，ap以ftp的方式，周期上报日志至ac指定文件夹

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| subid=6 | subid\_len |补丁开关 | 保留 |

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| 补丁命令长度 | 补丁命令................... |

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Ap补丁开关：0代表关闭，1代表开启

补丁命令：为临时更改ap配置，免升级而新增该消息接口，ap得到该命令会直接执行

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| subid=7 | subid\_len | 黑名单开关 | 保留 |

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++| 黑名单长度 | 黑名单ip列表 ................. |

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| 白名单长度 | 黑名单ip列表 ................. |

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ap重定向开关：0代表关闭，1代表开启

黑名单长度：2字节

黑名单ip列表: 多个域名间的用‘%’进行分隔，下发给ap，最终被设置在ip的dns\_deny.conf表中

白名单长度：2字节

白名单ip列表: 多个域名间的用‘%’进行分隔，下发给ap，最终被设置在ip的dns\_deny.conf表中

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| subid=8 | subid\_len | sd内容同步开关 | 更新周期（分钟）|

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++| 同步目标端口号 | 更新目标名称长度 |

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| 同步目标名称 ...................................... |

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sd内容更新开关：0代表关闭，1代表开启

更新周期：1字节，单位分钟

更新目标端口号：默认5241

更新目标名称: 形如192.168.68.26::xxx/ 即为同步的目标

#### 3.3.8 Configuration Update Response

1. **描述**

Msg type=8，Capwapc发至capwapd，ap收到echo response携带的配置id后，以此消息回应。

1. **携带的msg element报文格式**
2. 厂商特征消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 37 | len |

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| Vendor Identifier |

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| element id = 0 | ap mac

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| ap mac |

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ID: 37 ,int格式

Len: 本消息元素的长度，int格式

Vendor Identifier：企业码

element id:自定义元素id=0

ap mac:形如0x00 0x11 0xb5 0x01 0x02 0x03

1. Result code消息元素

0 1 2 3

0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7

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| ID = 33 | len |

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| value ….. |

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ID: 33 ,int格式

Len: 本消息元素的长度，int格式

Result Code:

1. 成功
2. reset失败，不能reset.失败。重启、恢复失败时回复
3. configuration 失败，请求的配置设定失败
4. configuration 失败，不支持请求的配置. (若不支持ap暂时不理会)
5. image date错误，校验和错误。升级失败时回复
6. 数据传输失败。版本下载失败时回复
7. **发送时机**

当ap收到echo resp时，若携带msg element =4096、4097、4098、4099时回复此消息。