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Encapsulation of EAP Messages in CAPWAP Control Plane
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Abstract

This document describes the scenario and requirement of encapsulating Extensible Authnetication Protocol (EAP) in the CAPWAP control plane. After the analysis and description, this document proposes the design of the new message types to encapsulate EAP messages.

Status of this Memo

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

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1. Introduction

Control and Provisioning of Wireless Access Points (CAPWAP) was designed as an interoperable protocol between the wireless access point and the access controller. This architecture makes it possible for the access controller to manage a huge number of wireless access points. With the goals and requirements established in[RFC4564] , CAPWAP protocols were specified in [RFC5415] , [RFC5416]and [RFC5417].

The specificaitons mentioned above mainly design the different control message types used by the AC to control multiple APs. The EAP messages, as key protocol exchange elements in the WLAN architecture also need to be encapsulated in the CAPWAP. However, the CAPWAP protocol does not specifies how to encapsulate the EAP message in its control plane. This situation makes it default to encapsulate the EAP messages in the CAPWAP-DATA plane.

We found issues of encapsulating EAP in the CAPWAP-DATA plane in the scenario where there is a split betweent the CAPWAP-DATA and CAPWAP-CTL plane. This document describes such scenario and proposes a resolution to the problem.

1.1. Conventions used in this document

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]

1.2. Terminology

Access Controller (AC): The network entity that provides AP access to the network infrastructure in the data plane, control plane, management plane, or a combination therein.

Access Point (AP): the same with Wireless Termination Point, The physical or network entity that contains an RF antenna and wireless Physical Layer (PHY) to transmit and receive station traffic for wireless access networks.

CAPWAP Control Plane: A bi-directional flow over which CAPWAP Control packets are sent and received.

CAPWAP Data Plane: A bi-directional flow over which CAPWAP Data packets are sent and received.

EAP: Extensible Authentication Protocol, the EAP framework is specified in [RFC3748].

2. Scenario and Analysis

The following figure shows where and how the problem arises. In many operators' network, the Access Controller is placed remotely at the central data center. In order to avoid the traffic aggregation at the AC, the data traffic from the AP is directed to the Access Router (AR). In this scenario, the CAPWAP-CTL plane and CAPWAP-DATA plane are separated from each other.

Note: a powerful AC that aggregates the data flows is not a long-term solution to the problem. Because operators always plan the network capacity at a certain level, but with the air interface bandwidth increasing (e.g., from 11g to 11n and 11ac), and the increasing number of access requests on each AP, the powerful AC could not always be "powerful" enough in the long run.

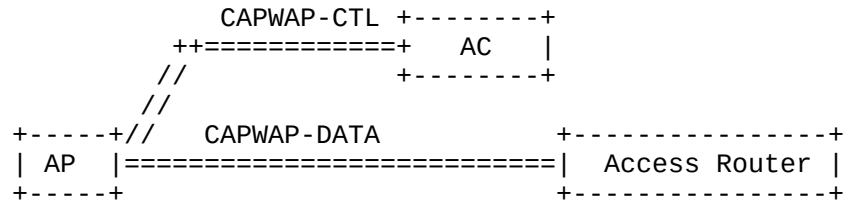


Figure 1: Split between CAPWAP-CTL and CAPWAP-DATA Plane

Because there are no explict message types to support the encapsulation of EAP packets in the CAPWAP-CTL plane, the EAP messages are tunneled via the CAPWAP-DATA plane to the AR. AR acts as authenticator in the EAP framework. After authentication, the AR receives the EAP keying message for the session. But AC is supposed to delieve these keying messages to the AP, and AR has no standard interface to ship them to the AP or the AC. This is unacceptable in the scenario of EAP-based auto-authentication.

Another scenario is the third-party WLAN deployment scenario, in which the access network is a rental property from an broadband operator different from the one who provides authentication services. As shown in Figure 2, The AP is broadcasting a SSID of the Operator #1, say "Operator-1-WLAN", but broadband access network is provided by another Operator #2. To authenticate the users of operator one, the users should be authenticated by the AC in operator one. The data traffic can be routed locally with the access router of operator #2. In this case, there is also a need of separation between CAPWAP-CTL and CAPWAP-DATA traffics.

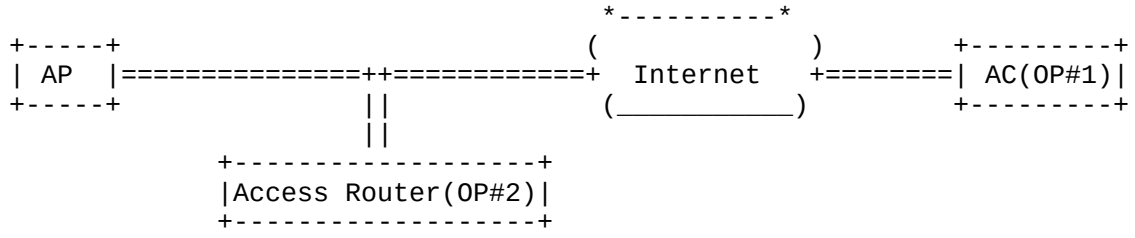


Figure 2: Access Service and Authentication Service Provided by different Operators

3. Encapsulation of EAP in CAPWAP-CTL Plane

In order to encapsulate EAP message in CAPWAP-CTL plane, we can reuse the control message header defined in RFC5415 and extend the message type to accommodate EAP messages.

The CAPWAP Control message header is shown in Figure 3. Only 26 message types have been defined in Section 4.5.5.1 of RFC5415. We can extend the message type here to encapsulate EAP messages.

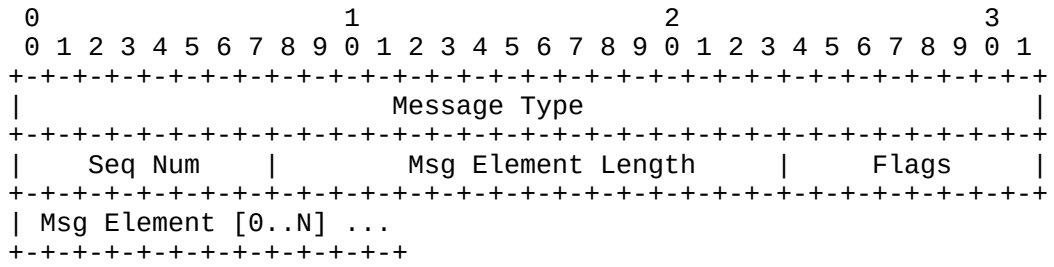


Figure 3: The CAPWAP Control Message Header

3.1. Control Message Type for EAP

This document defines a new control message type for EAP, i.e."AUTHENTICATION CONTROL". The message type value is to be defined by IANA.

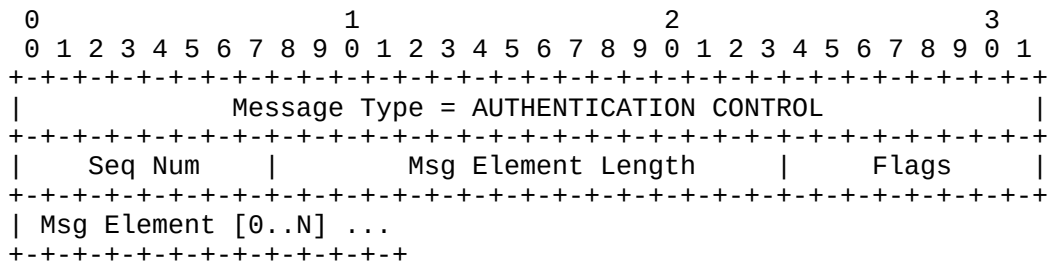


Figure 4: The CAPWAP-EAP Control Message Header

The Seq Num is design to match the response with the request for other control messages like "Discovery Request" and "Discovery Response". But this field is not useful for authentication control, because the EAP message encapsulated between the AP and AC is not handled in a request-response way. For AUTHENTICATION CONTROL messages, the AP and AC do not need to handle the ’Seq Num’ field.

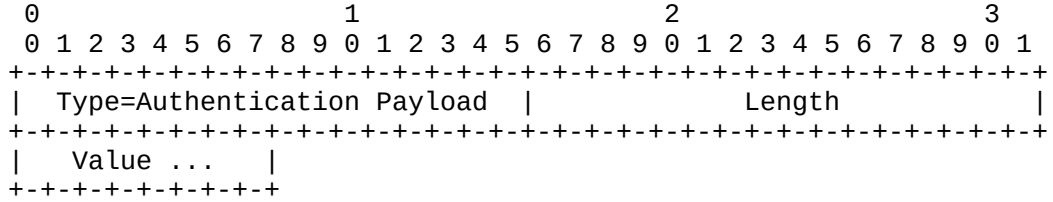
Msg Element Length field indicates the number of bytes following the Sequence Number field.

Flags field is left for future definition.

3.2. Message Element of the EAP

The message element(s) carry the information pertinent to each of the control message types. Every control message in this specification specifies which message elements are permitted.

We define the message element of EAP message in the following figure.



Message Element for EAP

Section 4.6 of [RFC5415] defines the semantics of Message Element Types. Type values from 1-49 have been used. An extended message element type is requested by this document to carry the EAP authentication payload.

4. IANA Considerations

This document has the following requests to the IANA.

CAPWAP Control Message Type Value for the EAP-AUTHENTICATION-CONTROL, as defined in Section. 3.1 of this document.

CAPWAP Control Message Element Type Value for the EAP-AUTHENTICATION-PAYLOAD, as defined in Section. 3.2 of this document.

5. Security Considerations

Security considerations for the CAPWAP protocol has been analyzed in Section 12 of [RFC5415]. This document extends the CAPWAP CONTROL Message Type and Control Message Element Type, and it does not introduce other security issues besides what has been analyzed in RFC5415.

6. Contributors

This document stems from the joint work of Hong Liu, Yifan Chen, Chunju Shao from China Mobile Research. Thank all the contributors of this document.

7. References

7.1. Normative References

[RFC5415] Calhoun, P., Montemurro, M., and D. Stanley, "Control And Provisioning of Wireless Access Points (CAPWAP) Protocol Specification", RFC 5415, March 2009.

7.2. Informative References

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[RFC5417] Calhoun, P., "Control And Provisioning of Wireless Access Points (CAPWAP) Access Controller DHCP Option", RFC 5417, March 2009.

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