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Chargeable User Identity
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Abstract

This document describes a new RADIUS attribute, Chargeable-User-Identity. This attribute can be used by a home

network to identify a user for the purpose of roaming transactions that occur outside of the home network.

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1. Introduction

Some authentication methods, including EAP-PEAP, EAP-TTLS, EAP-SIM and EAP-AKA, can hide the true identity of the user from RADIUS servers outside of the user's home network. In these methods, the User-Name(1) attribute contains an anonymous identity (e.g., @example.com) sufficient to route the RADIUS packets to the home network but otherwise insufficient to identify the user. While this mechanism is good practice in some circumstances, there are problems if local and intermediate networks require a user identity in order to enforce usage policies.

For example, local or intermediate networks may limit the number of simultaneous sessions for specific users; they may require a chargeable-user-identity in order to demonstrate willingness to pay or otherwise limit the potential for fraud.

This implies that an authenticated and unique identity provided by the home network should be able to be conveyed to all parties involved in the roaming transaction for correlating the authentication and accounting packets.

Providing a unique identity, called the Chargeable-User-Identity (CUI) to intermediaries, is necessary to fulfill certain business needs. This should not undermine the anonymity of the user. The mechanism provided by this draft allows the home operator to meet these business requirements by providing a temporary identity representing the subscriber and at the same time protecting the anonymity of the subscriber.

1.1 Motivation

Several organizations, including WISPr, GSMA, 3GPP, Wi-Fi Alliance, IRAP, have been studying mechanisms to provide roaming services, using RADIUS. A mechanism for providing the current deployments with the capacity to deploy, bill and oversee WPA networks against fraud.

The CUI attribute has been designed to close operational loopholes in RADIUS specifications that have impacted roaming solutions negatively, especially when tunneled protocols with multiple identities, such as PEAP or TTLS, are used. Use of the CUI is geared to multi-identity EAP authentications which are, for the most part, recent deployments. A chargeable identity reflecting the user profile authenticated by the home network is needed in such roaming scenarios.

The CUI support by RADIUS infrastructure is driven by the business requirements between roaming entities. Therefore whether a RADIUS

server/proxy or client accepts or rejects the presence or lack of presence of the CUI attribute is a matter of business policy.

Some other mechanisms have been proposed in place of the CUI attribute. These mechanisms are insufficient or cause other problems. It has been suggested that standard RADIUS Class(25) or User-Name(1) attributes could be used to indicate the Chargeable-User-Identity. However, in a complex global roaming environment where there could be one or more intermediaries between the NAS and the home RADIUS server, the use of aforementioned attributes could lead to problems as described below.

- On use of RADIUS Class(25) attribute:

[RFC2865] states: "This Attribute is available to be sent by the server to the client in an Access-Accept and SHOULD be sent unmodified by the client to the accounting server as part of the Accounting-Request packet if accounting is supported. The client MUST NOT interpret the attribute locally." So RADIUS clients or intermediaries MUST NOT interpret the Class(25) attribute, which precludes determining whether it contains a CUI. Additionally, there could be multiple class attributes in a RADIUS packet with unspecified ordering, which makes it hard to the entities outside home network to determine which one contains the CUI.

- On use of RADIUS User-Name(1) attribute:

The home network could use User-Name(1) in the Access-Accept message to convey the CUI to intermediaries and the NAS. However, as the Access-Accept packet is routed to the NAS, the User-Name(1) attribute could be (completely) rewritten by an intermediary and therefore the NAS or other intermediaries along the way will not have access to the CUI. Furthermore, the NAS may use the original value of the User-Name(1) attribute (the one sent in the Access-Request packet) in the Accounting-Request packets to ensure the billing follows the same path as authentication packets.

The CUI attribute provides a solution to the above problem and avoids overloading the use of current RADIUS attributes (e.g., User-Name(1) re-write). The CUI is the correct standards-based approach to fixing the problems which have arisen with multiple-identity RADIUS authorization and accounting methods. It does not solve all related problems, but does provide networks the ability to bill and oversee WPA networks against fraud. When the home network assigns a value to the CUI, it asserts that this value represents a user in the home network. The assertion should be temporary. Long enough to be useful for the external applications and not too long such that it can be used to identify the user.

1.2 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](#)].

3GPP - Third Generation Partnership Program
AAA - Authentication, Authorization and Accounting
CUI - Chargeable-User-Identity
GSM - GSM Association
IRAP - International Roaming Access Protocols Program
NAS - Network Access Server
PEAP - Protected Extensible Authentication Protocol
TTLS - Tunnelled Transport Layer Security
WISPr - Wireless ISP Roaming
WPA - Wi-Fi Protected Access

2. Operation

This document assumes that the RADIUS protocol operates as specified in [[RFC2865](#)], [[RFC2866](#)], dynamic authorization as specified in [[RFC3576](#)], and the Diameter protocol as specified in [[RFC3588](#)].

2.1 Chargeable-User-Identity (CUI) Attribute

This attribute serves as an alias to the user's real identity. It is provided by the home network as a supplemental or alternative information to User-Name(1). RADIUS clients (proxy or NAS) outside the home network MUST NOT modify the CUI attribute.

In accordance to business policies, the RADIUS server (a RADIUS proxy, home RADIUS server) may include the CUI attribute in the Access-Accept message destined to a roaming partner.

If an Access-Accept message without the CUI attribute was received by a RADIUS client (NAS or Proxy) that requires the presence of the CUI attribute, then the Access-Accept message MAY be treated as an Access-Reject message based on local policies.

If the CUI was included in the Access-Accept message, RADIUS client (Proxy or NAS) that supports the CUI attribute MUST ensure that the CUI attribute appears in the RADIUS Accounting-Request (Start, Interim, and Stop).

RADIUS client (Proxy or NAS) that does not support the CUI attribute MAY ignore this attribute or MAY treat the Access-Accept as Access-Reject.

If RADIUS client (Proxy or NAS) requires the presence of the CUI attribute in the Access-Accept, it MUST indicate its requirement by including this attribute with a nul character for its data field (hereafter, it is also referred to as a nul CUI) in the Access-Request message.

If a home RADIUS server that supports the CUI attribute receives an Access-Request containing a nul CUI, it MUST include the CUI attribute in the Access-Accept. Otherwise, if the Access-Request does not contain a null CUI, the home RADIUS server MUST NOT include the CUI attribute in the Access-Accept.

A RADIUS server (a RADIUS proxy or the home RADIUS server) that requires the presence of the CUI in the Accounting-Response messages (Start, Stop, Interims) MAY respond with an Access-Reject message if it receives an Access-Request message from a RADIUS client, or proxy chain that does not support the CUI attribute. The Access-Reject message MUST include Error-Cause attribute [[RFC3576](#)] with value (to-be-defined) (decimal), "CUI-Support-Required".

If the NAS supports CUI attribute then the CUI attribute MAY also be used as one of the identity attribute in Disconnect Message and Change of Authorization messages defined by [[RFC3576](#)]. Determination of NAS support for the CUI is outside the scope of this document.

A summary of the RADIUS CUI Attribute is given below.

0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
+--+																					
Type Length String...																					
+--+																					

Type: TBD for Chargeable-User-Identity.

Length: >= 3

String:

The string identifies the CUI of the end-user and is of type UTF8String. This string value is a reference to a particular user. The format and the interpretation of the string value, and the binding lifetime of the reference to the user is determined based on business agreements. For example, the lifetime can be set to one billing period. In cases where the attribute is used to indicate the NAS support for the CUI, the string value contains a nul character.

3. Attribute Table

The following table provides a guide to which attribute(s) may be found in which kinds of packets, and in what quantity.

Request	Accept	Reject	Challenge	Accounting	#	Attribute
				Request		
0-1	0-1	0	0	0-1	TBD	Chargeable-User-identity
0	0	0-1	0	0	101	Error-Cause

[Note 1] If the Access-Accept contains CUI then the NAS MUST include the CUI in Accounting Requests (Start, Interim and Stop) packets.

[Note 2] The Error-Cause attribute is defined in [[RFC3576](#)].

Change of Authorization and Disconnect-Request

Request	ACK	NAK	#	Attribute
0-1	0	0	TBD	Chargeable-User-Identity

[Note 3] Where CUI attribute is included in Disconnect-Request or CoA-Request messages, it is used for session identification purposes only. This attribute MUST NOT be used for purposes other than identification (e.g. within CoA-Request messages to request authorization changes).

4. Diameter RADIUS Interoperability

In deployments with both RADIUS and Diameter interworking, a translation agent will be deployed and operate in accordance to the NASREQ specification.

5. IANA Considerations

5.1 CUI RADIUS Attribute

This document uses the RADIUS [[RFC2865](#)] namespace, see "<http://www.iana.org/assignments/radius-types>". This document instructs IANA to assign a new RADIUS attribute number for the CUI attribute.

CUI

TBA

5.2 Error-Cause Attribute

This document instructs IANA to assign a new Error-Cause attribute [[RFC3576](#)],

"CUI-Support-Required" TBA

6. Security considerations

The CUI attribute must be protected against Man-in-the-Middle attacks. The CUI appears in Access-Accept and Accounting-Requests packets and is protected by the mechanisms that are defined for RADIUS [[RFC2865](#)] and [[RFC2866](#)]. Therefore there are no additional security considerations beyond those already identified in [[RFC2865](#)] and [[RFC2866](#)].

Message-Authenticator(80) and Event-Timestamp(55) can be used to further protect against Man-in-the-middle attacks.

It is strongly recommended that the CUI form used is such that the real user identity is not revealed. Furthermore, where a reference is used to a real user identity, the binding lifetime of that reference to the real user be kept as short as possible.

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